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Change in global Climate and Prevalence of Visceral Leishmaniasis

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Abstract- Leishmania donovani, causes Visceral Leishmaniasis (VL), which is very serious disease and endemic in warmer part of the world covering almost 88 countries. It is most prevalent in India, Bangladesh, southern Sudan, Nepal and northeast Brazil. VL is transmitted by an insect vector i.e. Sand fly (Phelobotomus argentipus) that lives in warmer places (cervics, tree hole, dung and domestic wastes) where humidity and temperature both are present at regular intervals in a day (humidity during night and temperature at day time). These conditions are essential / necessary for the survival of vector, parasite development and for their distribution. But now a day, due to global climate changes and temperature increases, which support the high degree of sand fly growth, the transmission of disease has increased manifold. The flooding also increase the transmission of larvae from one place to another place thus also increases the distribution of disease.

Index Terms- Leishmania donovani, Visceral Leishmaniasis, Sand fly, Temperature, Humidity.

I. INTRODUCTION

Visceral Leishmaniasis (VL) (Leash'ma NIGH a sis) is a vector- borne anthrozoonotic disease that is also known as Kala-Azar (Hindi: kala means black, azar means sickness), was first described by Leishman and Donovan in 1903. They separately demonstrated VL parasites in stained smears prepared from the spleen of patients suffering from a malaria-like illness.

It is caused by obligate intracellular macrophage protozoan *Leishmania donovani*, which belongs to the genera *Leishmania* within the family *Trypanosomatidae*, caused a group of diseases called **Leishmaniasis.** The causative organism of VL in the Indian subcontinent and Africa is *L. donovani*. The name *L. donovani* has been given by eminent scientist Sir Ronald Ross.

According to the findings of "impact of climate variability and change on Leishmaniasis", the distribution of Leishmaniasis is affected by the global climatic changes. It is endemic in warmer part of the world covering almost 88 countries (16 developed and 72 developing countries) around the globe with a total of 350 million people at risk and 12 million cases of infection. Out of 5 lahks cases of VL, more than 90 percent are reported from India, Bangladesh, southern Sudan, Nepal and northeast Brazil.

II. CURRENT DISTRIBUTION AND RISKS

VL is considered to be an endemic disease, although its incidence increased significantly in the region during the 1990s. According to WHO (1994), about 25-70% of VL cases are infected with HIV and non-HIV VL incidence also present at a high rates. The worldwide distribution of Leishmaniasis is limited, in Europe, by the distribution of vector sand fly (*Phelobotomus argentipus*) and its cold climate, supports to internal development of specific species of *Leishmania*, and tendency to take blood from animals or humans only.

Since the mid-1990s, the worldwide geographical distribution of endemic Leishmaniasis has expanded. This spread of sand fly is probably due to a combination of various factors, which include, demographic change, land-use / land cover changes that create new habitats and / or changes in microclimate, and changes in seasonal climate.

Populations living in rural and peri-urban areas are at risk because here sand flies are prevalent. VL used to be found predominately in children but in recent years an increasing proportion of adult cases (non-HIV) also have been reported. This change in age distribution is probably caused by several factors, such as changes in human exposure patterns, environmental changes, and improvements in case diagnosis and notification. Improvements in nutritional and general health status in n children have probably played a roll in reducing the characteristic high susceptibility of children to this disease. The sand fly vector is mainly active during the night, and the highest risk for contracting the disease from sand fly bites is therefore between dusk and dawn.

III. INFLUENCE OF ENVIRONMENTAL AND CLIMATIC FACTORS ON DISEASE RISK

The distribution of VL is significantly less than the distribution of the sand fly vectors, because the transmission or distribution of disease is based on the vector abundance, its survival in environment, transmission and biting rate. It is also depend on the incubation period of the parasite and the length of transmission season. All of these parameters are based on the climate conditions. At the places where the temperature has been increases due to climatic changes, the prevalence of the disease have been increased many fold in those areas.

IV. Effect of Temperature & Humidity on Survival of Sand Fly

Temperature and humidity plays an important role in survival of sand fly, development and its activity. Sand fly (*Phlebotomus argentipus*) can survive cold temperatures in diapause (overwintering), which is initiated by a combination of low temperature and reduced daylight and can last 4 to 8 months depending on location. Temperature also affects the activity and growth of parasite. The worldwide distribution of sand flies is considered to be confined to areas that have at least one month with a mean temperature of 20°C.

Sand flies are sensitive to sudden temperature changes and usually prefer those regions where small differences maximum and minimum temperatures are slightly differ. Sand fly survival can be reduced if the climate gets too hot and dry, even though the flies may rest in cold, humid places during the daytime. Few species of sand fly live in tree holes and trunks. Peridomestic species rest on walls and, at hot times of the day, retreat into cracks and crevices. Poroton stone buildings provide favourable condition for sand fly growth because they store humidity during night and evaporate during day. These shows that climate directly affect the growth of sand fly and distribution of VL disease in addition to it, climate also has indirect impacts on disease transmission or sandfly by influencing

1. The distribution of hosts;
2. The local vegetation (important as resting sites and sugar sources);
3. Possible impact of future climate risks

With climate change, the distribution range of both the sandfly vector and the pathogen may extend northwards and into higher altitudes (WHO, 1999). In currently endemic areas, higher seasonal temperatures would lead to prolonged activity periods and shorter diapause periods. This could result in an increased number of sandfly generations per year. As climatic temperatures increases, it accelerates maturation of the leishmanian parasite, and also increasing the risk of infection. However, if the climate conditions are too hot and dry, vector survival rate is decreases and the disease may disappear from some localities.

V. Conclusion

The rises in temperature in day time and humidity level during night time have greatly influenced the growth of flies and the distribution of Leishmaniasis. But on the contrary to these, in the cold climatic countries the prevalence is limited because the growth of fly is limited and they are not able to suck the blood in night. High level of precipitation (rain) has also played very important role in the spared of disease, flooding may spread the vector of disease and the larvae of fly to distant and non infected areas also. Thus, climatic changes plays very important role in the distribution and spread of the disease.

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