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ORIGINAL ARTICLE

Analysis of Spatial Distribution of Leishmaniasis and its Relationship with Climatic Parameters (Case Study: Ilam Province)

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ABSTRACT
Leishmaniasis is a parasitic diseases which is transmitted by bite of sandflies abscess to humans Prevalence and publishing of the disease influenced by economic - social and cultural issues, and especially environmental conditions and natural disasters. So far different parts of Iran has been identified.Ilam is another focus of disease. For this research, daily data of 7 weather ingredients 7 weather station Ilam , Ivan , Abdanan, Valley City, Srablh, Mehran, Dehloran.Statistical period was1380 to 1391.informations amount of disease outbreaks during two period in level Combat Centerwith Contaminated and non-Communicable disease hygienic center were prepared. One of them was from 1380 to 1391 separately year and city, final Figure of distribution disease base on obtained. Another one wasfrom1388 to 1391 base on condition of distribution monthly, seasonal and annual changes in disease prevalence was evaluated. The results of research indicate incidence of maximum disease in the second half year especially in winter and autumn occur. Results of correlation analysis among outbreak amount of skin disease leishmaniasis and climatic parameters effective thereon in region of case study indicate correlation of strong positive and significant between the mean monthly temperature, maximum monthly temperature, maximumof monthly absolute temperature, with mean monthly rainfall have inversely correlated and weak correlation between The others parameters And disease incidence obtained .
***Key words**: Leishmaniasis,Ilam, Climatic parameters, Dehloran and mehran, Spatial Analysis*

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INTRODUCTION

Leishmaniasis is Parasitic diseases by bite of sandflies abscess to humans is transmitted [10] World health organization leishmaniasis component diseasesof major infectious and tropical in world has introduced .In human diseases caused by leishmaniasis pure dermal disease (dermal leishmaniasis)that skin and mucous both affects leishmaniasisof skin - mucous is called or thatgeneral form (systemic) covers entireof body. This is known as visceral leishmaniasis[2]. So far two types dermal leishmaniasis known .In town type to dry leishmaniasis is known. Its reservoir is dogs and humans .In type of rural that say wet leishmaniasis rat is reservoir disease. The wound usually a few weeks until 6 months and maximum 18 months remains,although this disease in whole year is common. But expressed complaints and irritations in autumn season is maximum [4]. Annually, about 1/5 to 2 million dermal leishmaniasis and 500000 visceral leishmaniasis in world level occur.This disease after malaria as the second health problem is considered .Known centers of global have leishmaniasis disease almost everyone between latitude 28 to 42 degrees of north latitude located [14].According to report of world health organization, leishmaniasis in 88 countries exist ./90 in middle east has been observed [13]. Prevalence and spread of major diseases such as leishmaniasis in addition to the economic, social and cultural under the influence are ecological factors. Among environmental factors vegetation types and climatic factors major role in growth process sandflies vectors of disease and subsequent have disease outbreak of skin leishmaniasis. Climate condition and vegetation area of case study for growth rodents and proliferation mosquitoes that can transmit disease is suitable [7]. Prevalence and development many of diseases have largely dependent with factors and natural conditions. Without recognition attention to natural conditions cannot protect of people against diseases also fight the disease scheduled [3]. So to combat these diseases study and recognition more than environment is essential [1]. Singh (1991): The studyrole of Climatic factors in distribution phlebotomizes sandflies in Rajasthan region of India has noted. in this article, the

temperature situation and relative humidity during the year and Abundance 8 different species of Sandflies has been studied .in region of case study Sandflies in range with relative humidity 31 to 85 percent was observed 0/30 in relative humidity lower than 0/30was not observed . Frank and *et al* [5]: Using time series analysis and linear regression to investigating the correlation between indicators NINO-3و VL Bahaya states in Brazil haveapplied.and indicate that significant increasing in rate of transmission disease El Nino conditions in since 1989 and 1995 exist. Chavas and Pascal (2006) to study cycle of climatic and forecasts of cutaneous leishmaniasis in kastaricaapplied. Their researches indicate that cutaneous leishmaniasis has three-year cycle that with temperature and the Southern Oscillation index has logical relationship.Talari *et al* [12]: A descriptive study conducted on 3028 patients in kashan their research showed that23/4 of patients in urban areas 0/66 in hot rural areas and 10/6 percent in mountain regions residents.Mostpollution rate in the months of November and December lowest rate is March In another study. In another studyNaghash*et al*[9] in Ahvaz this conclusion received most common seasonal of leishmaniasis Ahvaz in the fall with ./49 and the lowest prevalence in spring with 0/9 was obtained .The main objective of this research Spatial Analysis distribution of leishmaniasis survey relationship between climate elements with prevalence of diseasein level of septic areas in Ilam . First, correlation coefficientbetween the number of patients and climatic variables obtained. Using of GIS software Figure of climatic parameters was prepared. Then used to weighted overlay model final Figure of distribution disease in province is provided.

MATERIALS AND METHODS

The area of study:

Ilam is located in West Countrymountains region. The regard toclimate has two climate of semi-humid cold in north with average of rainfall 639 mm hot desert, with average of rainfall 200 mm in southern province. The province is 20/150 km. approximately 2/1percent total area of country will form .Ilam is west Zagros mountains between 31 degrees and 58 minutes 34 degrees 15 minutes north latitude from the equator and 45 degrees 24 minutes 48 degrees and 10 minutes east of the prime meridian is located inwestern corner of country . Ilam province of west with Iraq, from south withKhuzestan, from east with lorestan and from north with Kermanshah is neighbor. (Figure 1) Ilam have nine city Abdanan, Ilam, Ivan, Valley City, Dehloran, Shyrvanchrdavl, malekshahi and Mehran .and based on Census 2011 have 557599 people [12].

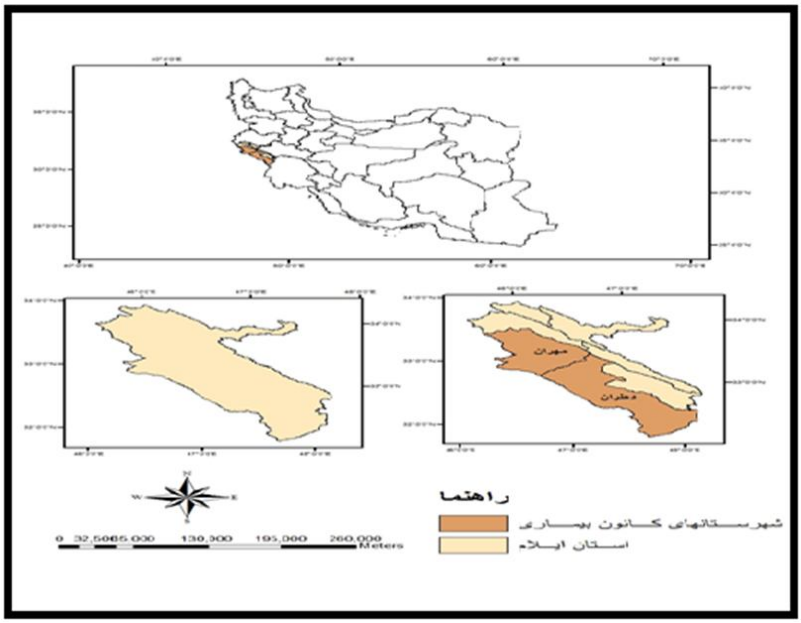

Figure 1: Location of Ilam and Disease centers.

Data

A-Information the incidence of Leishmaniasis disease.

In this article, two types of data prevalence amount of disease in the affected areas have been used. One information to patient's separation of year and city during 10 years from 1380 to 1391 health centers in Ilam province was placed under the care and treatment. From Health Center was received .and finalFigure of distribution disease according to the statistics provided .In part of this research status of monthly distribution seasonal and annual changes in incidence of disease was evaluated. Data 2818

patients from their files were extracted. Features Leishmaniasis in Ilam province during 2001 to 2012 was determined.

Meteorological data

Include annual data and monthly eleven meteorological elements monthly temperature , maximum temperature of absolute monthly, mean of monthly maximum temperature, minimum mean monthly relative humidity, Average relative humidity, altogether annually sunshine hours, Maximum Average monthly relative humidity from seven synoptic weather station Abdanan,Ilam, Ivan, Valley City, Dehloran, Srablh, Mehran is since2001-2012.

Method

This research has been applied, study methods is descriptive-analytical for to gather data two methods of library and field method direct observation is used . First, the correlation between climatic factors and cutaneous disease was achieved in seven cities. Using GIS Figure ping of climatic parameters were Prepared. Then used to weighted overlay model final Figure of distribution disease in province isprovided. For integration, layer model of weight o combination was used.

Final Figure: [T1× (w1)] + [T2× (w2)] +…… [TN× (wn)]

W is weight of layer

T information layer

RESULTS

The study relationship between disease incidence and climatic factors

Analysis of climate elements and relationship the number of patients (Table 1) On focus of cutaneous Leishmaniasis in Ilam done .The results obtained of review Climatic features indicate disease is most correlated with average of monthly temperature (3 Figure) The mean of monthly maximum temperature (Figure 4), mean maximum temperature of absolute monthly (Figure 5) and Mean monthly rainfall (Figure No. 6). So as for to final Figure main focus disease are cities Dehloran and Mehran .Dehloran has hot and dry climate average annual rainfall about 260 mm. average temperature is 17-49 degrees Celsius is changing . another focus disease is located in Mehran .Dehloran has climate hot and dry mean annual rainfall about 200 mmthe average of temperature is changing from 20 to 49 ° C. Thus according to the temperature condition in this two city in thermal appropriate range for growth and sandflies activities , under the climatic conditions of bitch sandflies in during year can Spawning Peak incidence of disease peak temperature in two city time delay is compeer Peak heat in this cities during months of April to September the peak incidence of disease during the months of October to March are recorded this issue the incubation period of the disease in leishmaniasis wet (type of rural) Which wound with a maximum delay of six months in body surface the patient can be observed corresponded . reduce incidence of disease in spring during the year under review due to inactivity sandflies in cold period due to adverse climatic conditions for activity sandflies is period of year precipitation review with disease incidence in Ilam according to Figure indicate that with precipitation have negatively correlated where rainfall is low and highest outbreaks of disease exist.The result of analysis indicate with other climate factors have poor correlation. Other cities in climatic conditions for growth of sandflies and so there is no disease outbreaks. However, according to background information in records of these patients have to travel to either city.

Table1: Relationship between number of patients and climatic parameters

Independent variables	r
The average of monthly temperature	0/618
The maximum of monthly absolute temperature	0/628
The mean monthly maximum temperature	0/562
Minimum mean monthly relative humidity	0/407
Number of frost days	0/374
Total monthly precipitation	0/574
The minimum of monthly absolute temperature	0/297
Monthly evaporation	0/252
The mean of relative humidity	0/102
Total of annually sunshine hours	0/091
The maximum average monthly relative humidity	0/071
Number of patients	1

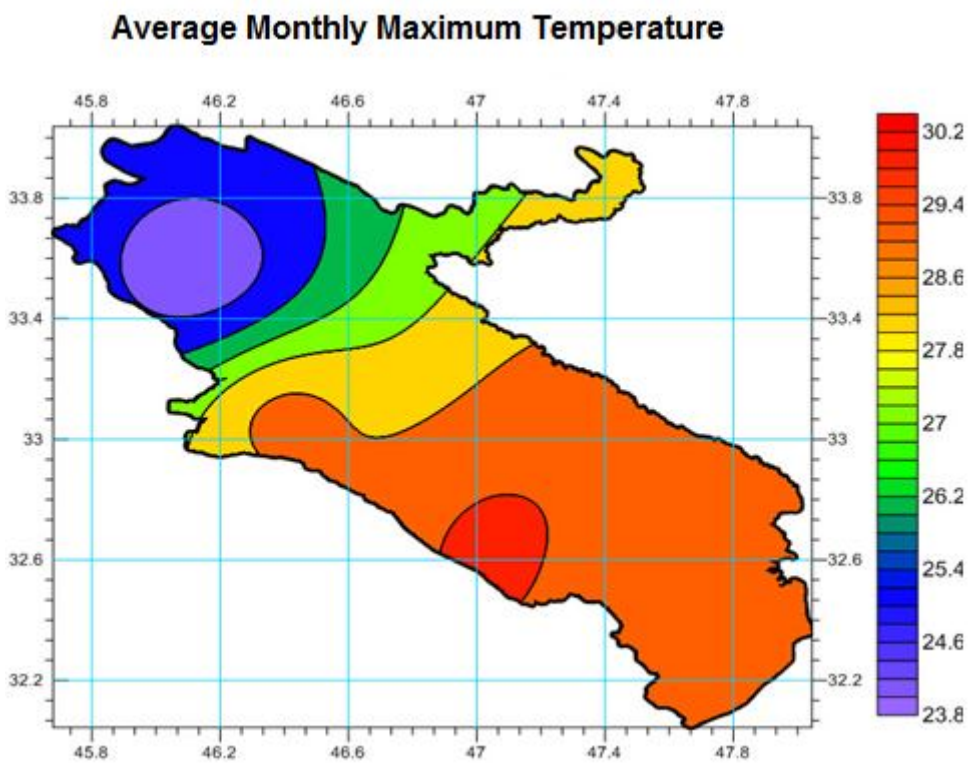

Figure 2: Average monthly maximum temperature

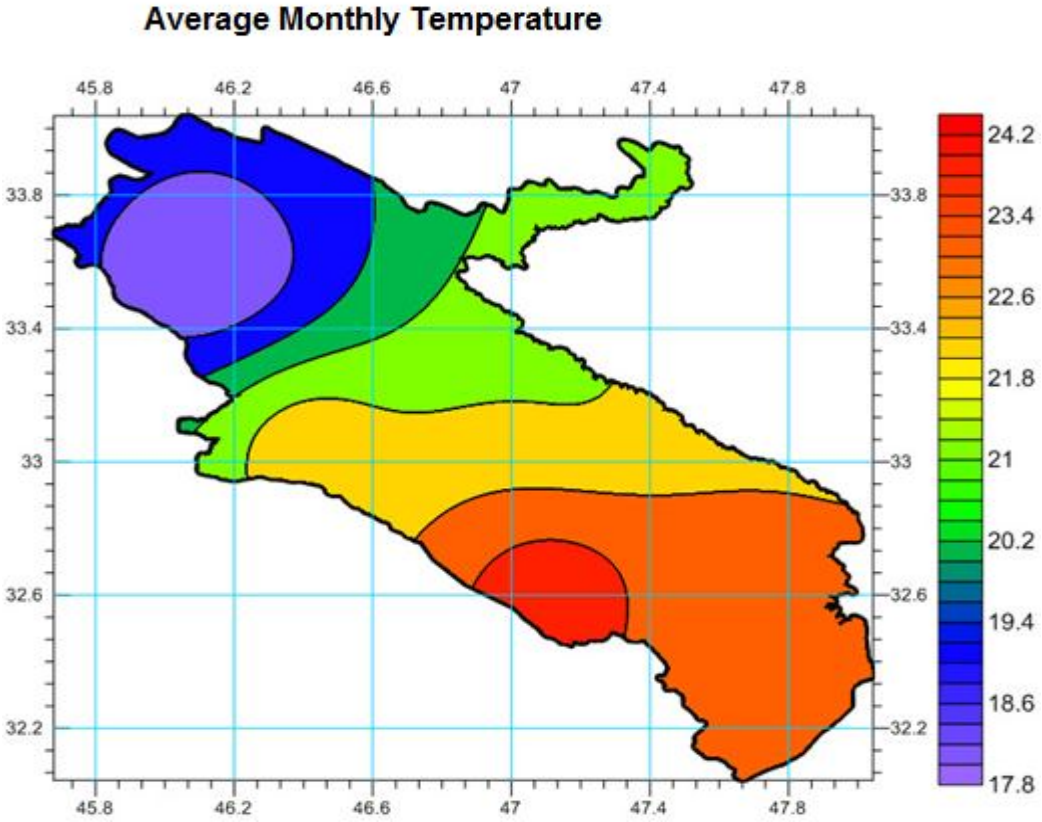

Figure (3): Average monthly temperature

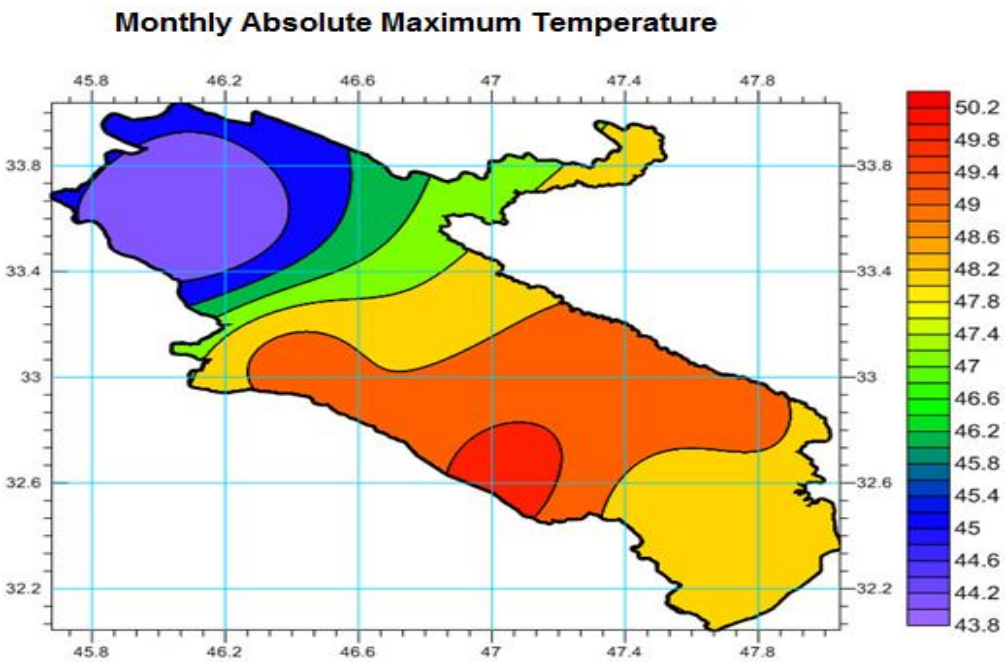

Figure (4): monthly absolute maximum temperature

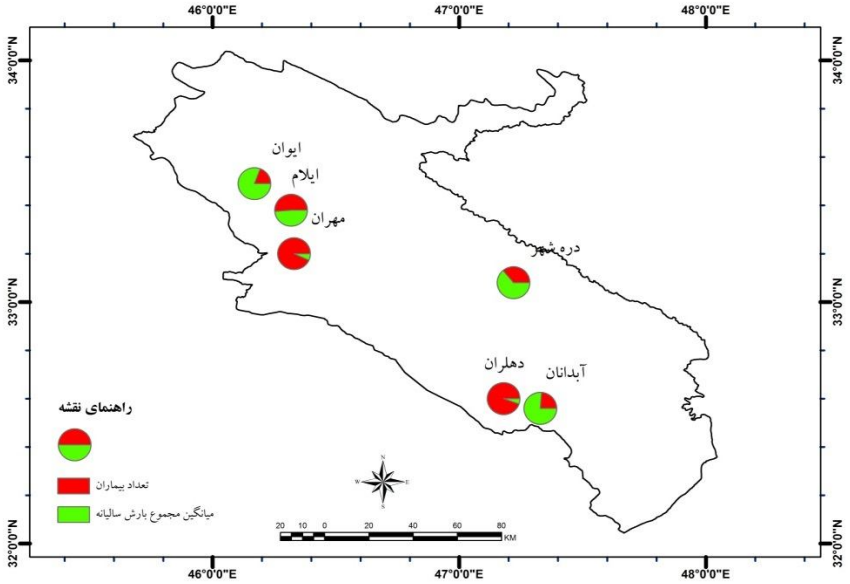

Figure (5): Relationship between annual rainfall and the number of patients

Results Spatial analysisof Climatic parameters

The results obtained Figure s of climatic parameters and the final Figure of distribution disease indicate that leishmaniasis in the South, South West and West provinces had the highest temperatures are more common . As can be seen in the final Figure (Figure 6) Red indicates a high risk the yellow color is indicative that the Northern and Eastern provinces is lower because have conditions of different weather in other cities conditions of incidence disease have not exist . However, the boundary of the two city particularly Mehran city that have pilgrimage places as well as an international border in Mehran quartering is high. Those who have traveled to the city from other cities to become diseased. So first Mehran and then Ilam and Dehloran have high Patients. As can be seen in Figure Shirvanchardavol, Ivan that is in the northern parts of the province has a semi-humid, and cold there is minimal risk of disease.

Seasonal distribution of leishmaniasis disease in the province.

The prevalence of leishmaniasis in Iran, unlike other infectious diseases is on the rise. So that Iran is part of eastern Mediterranean countries, prevalence leishmaniasis is high that perhaps the most important parasitic disease know After malaria in Iran Annually in 20 to 40 cases per 100 thousand people in the

country are catching leishmaniasis this number has been steady at 15 to 20 years [4]. Ilam is one of the endemic diseases of cutaneous leishmaniasis the type of rural. Centers infected with Leishmaniasis mainly in tropical areas of South, South West and West Provinces especially in the northern and mountainous areas are less aggressive disease (Figure 6). Indicate total number of patients with cutaneous leishmaniasis in seven city. FinalFigure based on statistics since2001 to 2012obtained. Taking into account the Commune period of the disease, and also the seasonal activity of sandflies vectors of leishmaniasis disease can be concluded that the highest cases of leishmaniasis disease in Ilam in the winter with 47/37 ,after the Fall ./33 transfer and few belongs in spring 12/73 In the summer is 17/81. The majority of outbreaks is in 2003 (1002) people and the lowest in2009 is with (415) people. Most cases of disease occur in the months of January, February and lowest in May and June. Prevalent type of leishmaniasis is rural and wet. Sand-fly bite since six months ago and latency period is six months. Sandflies peak in the first half o and the peak incidence is in the second half of year.

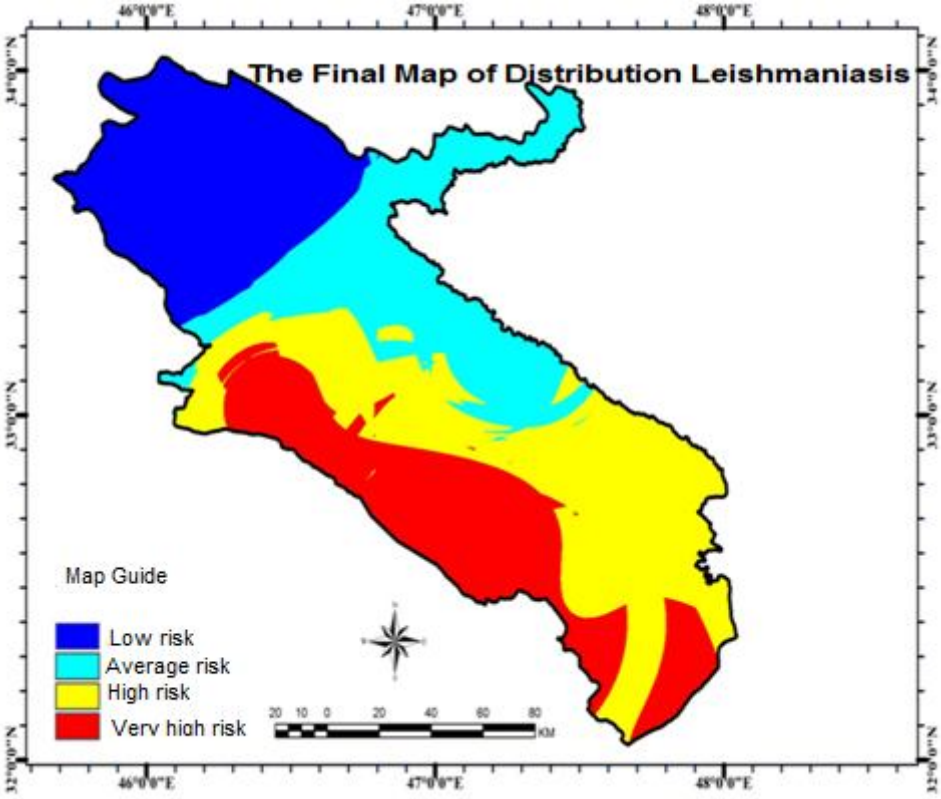

Figure (6): The Final Figure of Distribution Leishmaniasis

CONCLUSIONS

The result of research indicate that most cases have been recorded from September to March and the highest incidence in winter 37/47 and after the fall with33 and summer with 17/81 and the lowest rate in the spring with 12/73. The results show The significant association exist between illness and the temperature and on this basis in hot, dry areas, especially Mehran and Dehloran where temperatures were high as the main focus of the disease were identified that the northern regions, especially in mountainous areas is less. Given the climatic conditions prevailing in this city there are conditions for growth of disease-carrying sandflies other cities are also considering additional information contained in the records of patients with a history of traveling had to one of this two city . Thus, high levels of relative humidity combined with temperatures unfavorable conditions during the cold winter for sandflies have caused the incidence of the disease in the spring period (the incubation period) is significantly reduced. Results of correlation analysis the incidence of cutaneous leishmaniasis and climatic parameters effective the study of area indicate that A significant positive correlation between the mean of monthly temperature, the maximum temperature, maximum temperature of monthly Absolute, and with rainfall rate have negatively correlated and there is a weak correlation between other parameters and disease. Thus, in areas where the temperature was high and rainfall low disease was more common. The results of correlation analysis between the temperatures with the incidence of cutaneous leishmaniasis by Sink (1999) carried out corresponded. The seasonal distribution of with results from a study conducted in Pakistan Multan 1 and all cases are reported in the winter, which is consistent.

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