



## Survey on Epidemiological Status and Incidence Rate of Cutaneous Leishmaniasis in Abadan County, Khuzestan Province, Southwestern Iran

Hamid Kassiri<sup>1\*</sup>, Reza Farhadinejad<sup>1</sup>, Masoud Lotfi<sup>2</sup>

<sup>1</sup>Health Research Institute, Infectious and Tropical Diseases Research Center and Department of Medical Entomology, School of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran,

<sup>2</sup>Abadan Health Center, Ilam University of Medical Sciences, Ilam, Iran.

### ABSTRACT

Cutaneous Leishmaniasis (CL) has been considered as a large hygienic challenge, and the epidemiological studies have been useful in controlling this problem, and also taking prevention stages. Khuzestan Province is one of the common foci of the wet or rural zoonotic CL in Iran. Due to the lack of data about the epidemiology and prevalence of CL in Abadan County (30°16'N 48°34'E), this study was conducted in this area within 2011-2015. This descriptive-analytical study was based on 179 cases of CL submitted to the medical and health centers of Abadan County (30°42'02"N 49°49'53"E) during the past years. The study was done by extracting the demographic and epidemiologic data from a standard information questionnaire as well as analyzing the study data via SPSS software with chi-square and T tests. Demographic information-epidemiologic features, such as the number and location of lesions on the body, job, month, season, age, gender was collected. The patients were diagnosed by direct microscopic examination of the samples and clinical information. All ethical issues were also addressed. The average incidence rate was reported to be 0.15 /1000 person. The results revealed that the number of the infected cases in Abadan was 179 people during the study. The most frequent age group was 21-30 years old (24.6%). Meanwhile, about 54.7% of CL patients were male and 45.3% were female. Housekeepers had the highest incidence (29.1%) of CL. The analysis of the lesions on the different parts of the body showed that 24.3% of the lesions occurred on the hand, 20.1% on the foot, 14.5% on the hand as well foot, and 11.7% on the face. The maximum number of CL cases was reported in the autumn with 34.1%. Most of the cases were seen in October (14.5%) and November (12.3%). About 59.2% of the patients had one ulcer. The findings showed an increasing and decreasing trend of the incidence and prevalence rate of CL over the period study in this area. Also, CL has been remaining a health threat in the future. Therefore, it is recommended that the regional authorities pay more attention to control the spread of the disease.

**Keywords:** Cutaneous Leishmaniasis, Epidemiology, Incidence, Iran

**HOW TO CITE THIS ARTICLE:** Hamid Kassiri, Reza Farhadinejad, Masoud Lotfi, Survey on epidemiological status and incidence rate of cutaneous leishmaniasis in Abadan county, Khuzestan province, southwestern Iran, Entomol Appl Sci Lett, 2018, 5 (2): 62-69.

**Corresponding author:** Hamid Kassiri

**E-mail** ✉ Hamid.Kassiri@yahoo.com

**Received:** 09/01/2018

**Accepted:** 23/04/2018

### INTRODUCTION

Cutaneous Leishmaniasis (CL) is a zoonosis caused by the bite of a female sand fly infected by leishmania species. It is characterized by a volcanic appearance, with a central crater, covered with granular tissues. Cutaneous Leishmaniasis heals spontaneously after a while, but leaves permanent scars. Although it is not a

dangerous disease, it is important for several reasons, such as delayed wound healing, relatively heavy treatment costs, and side effects of various treatment methods [1].

The World Health Organization (WHO) has supported and recommended the conduction of studies on leishmaniasis, as one of the six important diseases of tropical regions. Leishmaniasis is caused by different unicellular parasites of the *leishmania* genus. *Leishmania tropica* and *Leishmania major* are etiologic agents of urban and rural leishmaniasis,

respectively. The urban CL has been seen in Afghanistan, Iran, Iraq, Morocco, Pakistan, Saudi Arabia, Syria and Yemen. The geographic distribution of rural CL includes the Middle East, northwest China, and North Africa. The recent epidemiological studies in different parts of the world indicated the emergence of new foci and a significant increase in its prevalence throughout the world, including the Middle East [2-5].

Before the implementation of control measures, the course of CL had fluctuated significantly in Iran. This was due to the migration of non-immune people from non-indigenous to indigenous areas, expansion of residential areas to gerbil colonies, migration of gerbils to residential areas, abundant reservoirs of rodent species in Iran, agricultural expansion in rural areas causing the migration of rodents and their growth in number, climate changes, and the lack of awareness about the disease and preventive measures. A total number of 593,273 cases with leishmaniasis was reported between 1983 and 2013 in Iran. Out of which, 590,569 patients had CL (99.5%) with the annual mean of 19,050 cases and mean incidence of 31 per 100,000 population. In 2013, Ilam Province, followed by Fars, had the highest incidence with the incidence rates of 103 (17% of total cases) and 87 (14% of total cases) per 100,000 population, respectively [6].

The rural CL is endemic to many rural areas of 17 out of 31 provinces in Iran, including Isfahan, Bushehr, Khuzestan, Ilam, Fars, Qom, Razavi Khorasan, North Khorasan, South Khorasan, Golestan, Yazd, Hormozgan, Kerman, Semnan, Sistan and Baluchestan, and Tehran [7, 8]. Some major cities and semi-urban areas, such as Mashhad, Sabzevar and Nishapur in northeast Iran, Kerman, Shiraz and Bam in south Iran, Kashan, Isfahan and Yazd in central Iran, are the foci of the urban CL [9].

The ecological and epidemiological studies on the important risk factors for the spread of CL in different areas of the country are very effective in disease control and prevention. Many studies have been conducted in previous years on the CL epidemiology in different parts of Iran. Regarding the lack of similar studies in recent years in Abadan, a county of Khuzestan Province with high prevalence of CL, this study was

conducted to investigate its 5-year (2011-2015) epidemiology.

#### MATERIALS AND METHODS:

At present, Khuzestan Province (31.3273°N 48.6940°E) is known as one of the endemic areas of rural CL in Iran. This province is located in the southwest of Iran, bordering Iraq and the Persian Gulf. The climate of Khuzestan is generally very hot and occasionally humid, particularly in the south, while winters are much more cold and dry. Summer time temperatures routinely exceed 45 °C, and in the winter it can drop below freezing, with occasional snowfall. Khuzestan is possibly one of the hottest places on the earth with maximum temperature in summer soaring up to 55 °C . The world's highest unconfirmed temperature was a temperature flare up during a heat burst in June 1967, with a temperature of 87 °C in Abadan . The province includes an area of 64,055 square kilometers and population of 4.711 million (2016).

In this analytical-descriptive study, all of the persons suspected to CL in the county were identified by passive case detection from 2011 to 2015. The sample was consisted of all the patients who referred to the laboratory of health services center in Abadan during the above mentioned five years for parasitological diagnosis of CL. Their disease was confirmed according to the laboratory test and a physician's diagnosis based on the shape of the lesion, the patient's history and response to the treatment. Smears were prepared from all of the cases, dried in air, fixed in 95% ethanol for 4 minutes, and finally stained with Giemsa stain. All of the prepared smears were observed for amastigote form of *Leishmania* under microscope. All of the studied cases were residents in Abadan County. Some epidemiologic – demography data including age, gender, the number of lesions, the location of lesions in different parts of the body, job, month and season of being infected were recorded in the questionnaires. The epidemiological status of CL was determined from the recorded data. The statistical analysis of the information was performed using chi-square and T tests in the SPSS software, to determine any significant

differences between epidemiologic - demographic factors and disease incidence. This study has been approved by the research ethics committee of Jundishapur University of Medical Sciences, Ahvaz, Iran. This project was in accordance to the ethical principles and national norms and standards for conducting medical research in Iran. The confidentiality of the records of patients was assured.

### RESULTS

The medical information of 179 patients with CL in Abadan was recorded between 2011-2015. The mean incidence rate of CL during the five years was 0.15 per 1000 population (Table 1). The findings showed an upward and downward course of incidence over this period. The age groups of 11-20 years with 41 patients (22.9%) and 31-40 years with 17 patients (9.5%) presented the highest and the lowest incidence rates, respectively. The nonparametric chi-square test showed a significant difference between the age groups in terms of the incidence rate of CL ( $p < 0.05$ ).

The investigation in the frequency of CL by sex showed that 98 patients (54.7%) were male (Table 1). The paired T-test presented no significant difference between males and females in terms of CL incidence rate.

Hand in 48 patients (24.3%), leg in 36 patients (20.1%), face in 21 patients (11.7%) and trunk in 7 patients (3.9%) presented the most affected

organs. Approximately 40% of patients had lesions in two or more organs (Table 2). The nonparametric chi-square test showed a significant difference between different body organs in the incidence rate of CL ulcers ( $p < 0.05$ ). According to the records, 128 patients (71.5%) had lesions like urban form and 51 patients (28.5%) had lesions like rural form of CL (Table 1). The T-test showed a significant difference between these two variables ( $p < 0.05$ ).

In addition, the highest and lowest incidence rates were reported in October with 26 patients (14.5%), and in September with 8 patients (4.5%), respectively (Table 3). The sand fly bites infected 38 patients (21.2%) in spring, 31 patients (17.3%) in summer, 61 patients (34.1%) in fall and 49 patients (27.4%) in winter (Table 4). The nonparametric chi-square test showed a significant difference between different months and seasons in the incidence rate of CL ( $p < 0.05$ ).

In total, the incidence rate of CL was higher among the housewives (29.1%) than other occupations over the research period. The nonparametric chi-square test showed a significant difference between different occupations in the incidence rate of CL ( $p < 0.05$ ). In addition, 106 patients (59.2%) had one lesion, 58 patients (32.4%) had two lesions and the remaining patients had more than two lesions. The nonparametric chi-square test indicated a significant difference between these two variables ( $p < 0.05$ ).

**Table 1:** Frequency distribution of cutaneous leishmaniasis cases by age group, incidence rates, gender, lesion frequency on the body, job and similarity of the appearance of lesions to dry or wet forms in Abadan County , southwestern Iran (2011-2015)

Year	Lesion frequency					Gender			
	1	2	3	≥4	Total	Male	Female	Total	
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	
2011	16(42.1)	18 (47.4)	2 (5.2)	2 (5.2)	38 (100)	19 (48.7)	20 (51.3)	39 (100)	
2012	14 (56.0)	8 (32.0)	2 (8.0)	1(4.0)	25 (100)	11 (44.0)	14 (56.0)	25 (100)	
2013	9 (56.3)	6 (37.5)	0 (0.0)	1 (6.2)	16 (100)	10 (62.5)	6 (37.5)	16 (100)	
2014	37 (62.7)	18 (30.5)	2 (3.4)	2 (3.4)	59 (100)	33 (55.9)	26 (44.1)	59 (100)	
2015	30 (75.0)	8 (20.0)	1 (2.5)	1 (2.5)	40 (100)	25 (62.5)	15 (37.5)	40 (100)	
Total	106 (59.2)	58 (32.4)	7 (3.9)	8 (4.5)	179 (100)	98 (54.7)	81 (45.3)	179 (100)	
Year	Job Groups					Incidence Rates			
	Housewife	Child	Student	Others	Total	Frequency	Incidence/1000		
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	231000		
2011	12 (30.7)	10 (25.7)	6 (15.4)	11 (28.2)	39 (100)	39 (21.8)	0.16		
2012	6 (24.0)	6 (24.0)	5 (20.0)	8 (32.0)	25 (100)	25 (14.0)	0.1		
2013	5 (31.2)	4 (8.0)	4 (18.8)	3 (18.8)	16 (100)	16 (8.9)	0.69		
2014	17 (28.8)	17 (28.8)	13 (22.1)	12 (20.3)	59 (100)	59 (33.0)	0.25		
2015	12(30.0)	10 (25.0)	7 (27.5)	11(27.5)	40 (100)	40 (22.3)	0.17		
Total	52 (29.1)	47 (26.3)	35 (19.5)	45 (25.1)	179 (100)	179 (100)	μ5 years 0.15/1000		
Year	Age Groups						Lesion		
	≤10	11-20	21-30	31-40	≥40	Total	Dry	Wet	Total
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
2011	11(28.2)	7 (17.9)	10 (25.7)	3 (7.7)	8 (20.5)	39 (100)	32 (88.9)	7 (11.1)	39 (100)
2012	6 (24.0)	6 (24.0)	7 (28.0)	4 (16.0)	2 (8.0)	25 (100)	16(64.0)	9 (36.0)	25 (100)
2013	4 (25.0)	6 (37.5)	2 (12.5)	2 (12.5)	2 (12.5)	16 (100)	13 (62.5)	6(37.5)	16 (100)
2014	10 (16.9)	18 (30.5)	12 (20.3)	5 (8.5)	14 (23.8)	59 (100)	36 (61.0)	23 (39.0)	59 (100)
2015	8 (20.0)	4 (10.0)	13 (32.5)	3 (7.5)	12 (30.0)	40 (100)	31 (77.5)	9(32.5)	40 (100)
Total	39 (21.8)	41(22.9)	44 (24.6)	17 (9.5)	38 (21.2)	179 (100)	128(71.5)	51(28.5)	179 (100)

**Table 2:** Frequency distribution of cutaneous leishmaniasis cases by lesion sites on the body in Abadan County , southwestern Iran (2011-2015)

Years Lesion sites	2011 No. (%)	2012 No. (%)	2013 No. (%)	2014 No. (%)	2015 No. (%)	Total No. (%)
Hands	3 (7.7)	5 (20.0)	4 (25.0)	22 (37.2)	14 (35.0)	48 (24.3)
Feet	7 (17.9)	5 (20.0)	2 (12.5)	11 (18.6)	11(27.5)	36 (20.1)
Faces	7 (17.9)	3 (12.0)	2 (12.5)	4 (6.7)	5 (12.5)	21 (11.7)
Trunks	4 (10.6)	1(4.0)	1 (6.25)	0 (0.0)	1(2.5)	7 (3.9)
Hands and Feet	5 (12.8)	3 (12.0)	4 (25.0)	11(18.6)	3 (7.5)	26 (14.5)
Hands and Faces	3 (7.7)	2 (5.0)	1(6.25)	3 (5.8)	1(2.5)	10 (5.9)
Faces and Hands	3 (7.7)	3 (12.0)	1(6.25)	4 (6.8)	4(10.0)	15 (8.5)
Faces and Feet	2 (5.1)	1 (4.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (1.6)
Others	5 (12.8)	2 (8.0)	1(6.25)	4 (6.8)	1 (2.5)	13 (7.2)
Total	39 (100)	25 (100)	16 (100)	59 (100)	40 (100)	179(100)

**Table 3:** Frequency distribution of cutaneous leishmaniasis cases by month in Abadan County , southwestern Iran (2011-2015)

Years Months	2011 No. (%)	2012 No. (%)	2013 No. (%)	2014 No. (%)	2015 No. (%)	Total No. (%)
April	4 (10.3)	2 (8.0)	1 (6.3)	4 (9.9)	3 (7.5)	13 (7.3)
May	3 (7.7)	2 (8.0)	1 (6.3)	4 (14.4)	2 (5.0)	13 (7.3)
June	3 (7.7)	2 (8.0)	1 (6.3)	4 (13.1)	2 (5.0)	11 (6.2)
July	1 (2.6)	1 (4.0)	2 (12.5)	3 (9.9)	3 (7.5)	11 (6.2)
August	2 (5.1)	2 (8.0)	1 (6.3)	4 (12.8)	3 (7.5)	12 (6.7)
September	1 (2.6)	2 (8.0)	0 (0.0)	4 (12.7)	2 (5.0)	8 (4.5)
October	5 (12.8)	3 (12.0)	2 (12.5)	7 (12.1)	7 (7.5)	26 (14.5)
November	5 (12.8)	4 (8.0)	2 (12.5)	5 (5.4)	5 (12.5)	22 (12.3)
December	4 (10.3)	3 (12.0)	1 (6.3)	5 (2.5)	3 (7.5)	18 (10.1)
January	3 (7.7)	1 (4.0)	1 (6.3)	7 (1.1)	3 (7.5)	14 (7.8)
February	4 (10.3)	2 (8.0)	2 (12.5)	6 (1.9)	4 (10.0)	18 (10.1)
March	4 (10.3)	1 (4.0)	2 (12.5)	6 (4.4)	3 (7.5)	18 (10.1)
Total	39 (100)	25 (100)	16 (100)	59 (100)	40 (100)	179 (100)

**Table 4:** Frequency distribution of cutaneous leishmaniasis cases by season in Abadan County , southwestern Iran (2011-2015)

Years Season	2011 No. (%)	2012 No. (%)	2013 No. (%)	2014 No. (%)	2015 No. (%)	Total No. (%)
Spring	10 (25.6)	6 (24.0)	3 (18.8)	12 (20.3)	7 (17.5)	38 (21.2)
Summer	4 (10.3)	5 (20.0)	3 (18.8)	11 (18.6)	8 (20.0)	31 (17.3)
Autumn	14 (35.9)	10 (50.0)	5 (31.2)	17 (28.9)	15 (37.5)	61 (34.1)
Winter	11 (28.2)	4 (16.0)	5 (31.2)	19 (32.2)	10 (25.0)	49 (27.4)
Total	39(100)	25 (100)	16 (100)	59 (100)	40 (100)	179 (100)

## DISCUSSION

The prevalence of CL has highly increased in Iran in recent years and spread even to non-affected regions; nevertheless, there have not been much relevant studies in some parts of the country.

The findings showed the incidence rate of 15 per 100,000 population in Abadan with a population of 230,000. The age groups of 21-30 and 11-20 years accounted for the majority of the patients. Feiz-Haddad [10], Kassiri in different studies in Shush County [11], Shushtar County [12] and Ganaveh County [13], and studies conducted in Brazil [14] and Pakistan [15] reported the highest prevalence of CL among the age group of 10-30 years. The incidence rate of CL in younger people may be attributed to it as an endemic disease in Abadan County. In the endemic regions, CL has had an upward trend of incidence up to the age of 15, and afterwards it

has become downward due to the acquired immunity.

In the current study, the number of male patients Kassiri (55%) was higher than female patients. This finding was consistent with the findings of Barati in Khatam County (61% male versus 39% female) [16], Abbasi in Gorgan County (68.6% male versus 31.4% female) [17], Kassiri in Ganaveh County (54% male versus 46% female) [13], Feiz-haddad in Khuzestan [10], and Kassiri in Shushtar [12]. In contrast, Dehghan reported the higher prevalence among females in Larestan County [18]. The higher prevalence of CL among males was because of the following reasons:

- The majority of male workers were seasonal migrant workers
- They worked in open environments
- They wore less clothes than women
- They were more active in abandoned areas and wetlands around the city, which are good places for sand fly growth and reproduction

More than one cutaneous lesions were observed in 59.2% of the participants. Hamzavi *et al.* reported that 55% of patients had one lesion, 17% had two lesions, and 28% had at least three lesions [19]. Yaghoobi *et al.* reported that 52% of the patients had one lesion, 17.4% had two lesions, and the remaining patients had at least three lesions [20]. Rafati *et al.* reported more than one lesion in 60% of the patients [21]. Dehghan *et al.* reported one lesion in 62.38% of the patients [18]. This finding can be attributed to the frequency and mechanism of bites by sand flies.

The results showed that hands and legs were the most affected organs, which was consistent with the findings of Talari in Kashan [22], Hamzavi in Kermanshah [19], and Zahirnia in Hamadan [23]. In contrast, face presented the most infected body part in Ebadi's study in Isfahan [24] and Karimizarchi's study in Sarakhs [25]. Moreover, a five-year study conducted in Saudi Arabia reported 34% of the lesions in the upper, and 42% in the lower extremities [26]. The short piercing mouthparts of the sand flies inhibited them to bite the covered parts of the host body, thereby increasing the chance of upper and lower extremity bites. As a result, an effective factor in the distribution of lesion was how the body parts have been covered up. Sand flies generally map out for the host and spot the feeding site by being attracted by chemical agents, such as the odor of the carbon dioxide, especially in the upper and lower extremities.

One of the most important factors influencing the CL prevalence is climate, which varies in different seasons and months of the year. The results showed that CL is more prevalent in fall and winter. On the other hand, the seasonal distribution pattern of CL in Abadan clearly confirmed the local transmission of the disease. This five-year study showed that fall and winter accounted for the majority of the cases, which was consistent with previous studies [27-29].

#### CONCLUSIONS:

The indigenous transmission phenomenon in the presence of appropriate reservoirs can be amplified, and result in regional endemic, thereby increasing disease endemicity in this county and other vulnerable regions. Therefore, the following measures should be taken for

disease management: the garbage and construction debris should be cleaned up or removed carefully, ruined places should be removed, and animal reservoirs and disease vectors should be identified and controlled by effective methods. Finally, people should be trained to get familiar with prevention methods and disease transmission mechanisms.

#### ACKNOWLEDGEMENTS:

This study was part of M.Sc thesis of Mr. Reza Farhadinejad. Special thanks to Health Research Institute, Infectious and Tropical Diseases Research Center, Jundishapur University of Medical Sciences, Ahvaz, Iran for financial support of this work (Project Number: 94161). Authors wished to express their sincere thanks to all the staff of the Health Centers in Abadan County, who helped sincerely in data collection.

#### REFERENCES

1. Ayatollah J, Karimi M. The prevalence of cutaneous leishmaniasis (CL) in the villages of Abarkuh' Yazd. Iranian Journal of Infectious Diseases. 2005; 10(30):13-18.
2. Martins LM. Eco - epidemiology of cutaneous leishmaniasis in Bariticupu, Amazon region of maranhao state, Brazil, 1996 - 1998. Icad Saude publica. 2004; 20(3):pp 735-743.
3. Babaei GR, Shayan A. An epidemiological study of cutaneous leishmaniasis and the investigation of scars with emphasis on seasons. Age and sex groups in Paalm, south of Lorestan province. Armaghan Danesh 2003; 8:51-57.
4. Postigo JA, leishmaniasis in the World Health Organization Eastern Mediterranean Region, Int J Antimicrob Agents. 2010; 36: 62-65.
5. World Health Organization (WHO). Control of the leishmaniasis: report of a meeting of the WHO expert Committee on the control of leishmaniasis. 2010; WHO Technical Report Series. 949. Geneva.
6. Shirzadi MR, Bonakdar-Esfehani S, Mohebbali M, Yaghoobi-Ershadi MR, Gharachorlo F, Razavi MR, Ruiz-Postigo JA. Epidemiological situation of cutaneous leishmaniasis in Iran

- during 1983 to 2013. *Journal of Infectious and Tropical Diseases*. 2016; 21(73):1-8.
7. Akhavan AA, Yaghoobi Ershadi MR, Mirhendi H, Alimohammadian MH, Rassi Y, Shareghi N, Jafari R, Arandian MH, Abdoli H, Ghanei M, Jalali-zand N, Khamesipour A. Molecular epizootiology of rodent leishmaniasis in a hyperendemic area of Iran. *Iranian j Publ Health*. 2010; 39: 1-7.
  8. Shirzadi MR, Cutaneous leishmaniasis control guideline in Iran. Zoonoses Control Department, Center for Communicable Diseases Control, Ministry of health and medical education, Tehran, Iran; 2012.
  9. Sharifi I, Poursmaelian S, Emergence of a new focus of anthroponotic cutaneous leishmaniasis due to *Leishmania tropica* in rural communities of Bam district after the earthquake, Iran. *Trop Med Int Health*. 2011; 16 (4): 510-513.
  10. Feiz-Haddad MH, Kassiri H, Kasiri N, Panahandeh A, Lotfi M. Prevalence and epidemiologic profile of acute Cutaneous Leishmaniasis in an endemic focus, South western Iran. *Journal of Acute Disease*. 2015; 4(4): 292-297.
  11. Kassiri H, Shemshad K, Lotfi M, Shemshad M. Relationship trend analysis of cutaneous leishmaniasis prevalence and climatological variables in Shush County, south-west of Iran (2003-2007). *Acad Entomol*. 2013; 6(2): 79-84.
  12. Kassiri H, Kassiri A, Lotfi M, Farajifard P, Kassiri E. Laboratory diagnosis, clinical manifestations, epidemiological situation and public health importance of cutaneous leishmaniasis in Shushtar County, Southwestern Iran. *J Acute Dis*. 2014; 3: 93-98.
  13. Kassiri, A. Kasiri, H. Najafi, M. Lotfi, E. Kasiri, Epidemiological features, clinical manifestation and laboratory findings of patients with cutaneous leishmaniasis in Genaveh County, Bushehr Province, Southern Iran *J Coast Life Med* 2014; 2 (12). 1002-1006.
  14. Jones T, Johnson W, Barretto A, Lago E, Badaro R, Cerf B, et al. Epidemiology of American cutaneous leishmaniasis due to *Leishmania braziliensis brasiliensis*. *Journal of Infectious Diseases* 1987; 156(1):73-83.
  15. Mujtaba G, Khalid M. Cutaneous leishmaniasis in Multan, Pakistan. *International Journal of Dermatology*. 1998; 37(11):843-845.
  16. Barati H, Barati M. Lotfi MH. Epidemiological study of cutaneous Leishmaniasis in Khatam. Yazd Province (2004-2013). *Paramed Sci Military Health*. 2015; 10:1-5.
  17. Abbasi AE, Ghanbary MR, Kazem NK. The epidemiology of cutaneous leishmaniasis in Gorgan (1998-2001). *Ann Military Health Sci Res*. 2004; 2: 275-278.
  18. Dehghan A, Ghahramani F, Hashemi B. The epidemiology of anthroponotic cutaneous Leishmaniasis in Larestan (2006-2008). *J Jahrom Univ Med Sci*. 2010; 8(3): 7-11.
  19. Hamzavi Y, Hamzeh B, Mohebbali M, Akhouni B, Ajhang K, Khademi N, et al. Human visceral leishmaniasis in Kermanshah province, western Iran, during 2011-2012. *Iran J Parasitol*. 2012; 7(4): 49-56.
  20. Yaghoobi Ershadi MR, Akhavan AA, Zahraei Ramazani AV, Abai MR, Ebrahimi B, Vafaei Nezhad R, et al. Epidemiological study in a new focus of cutaneous Leishmaniasis in the Islamic Republic of Iran. *East Mediterr Health J*. 2003; 9:816-826.
  21. Rafati NA, Shapourimoghadam A, Ghorbani RA. Epidemiological study of cutaneous leishmaniasis in Damghan (2000-2006). *Koomesh*. 2007; 8: 247-253.
  22. Talary S, Vakili Z, Moshtaqi S. Prevalence of cutaneous leishmaniasis in the city of Kashan, 1994-2000. *Journal of Feiz*. 2003; 26: 72-76.
  23. Zahyrnya L, Moradi A, Norouzi N, Bathaie J, Erfani KH, Moradi A. Epidemiology of cutaneous leishmaniasis in Hamedan Province from 2002 to 2007. *Journal of Hamedan University of medical Sciences*. 2009; 16(1): 43-47.
  24. Ebadi M, Hejazi S. Epidemiology of cutaneous leishmaniasis in Isfahan Borkhar school students. *Journal of Kerman University of Medical Sciences*. 2003; 2(2):92-98.
  25. Karimi-Zarch A, Mahmoodzadeh A, Vatani Ah, Shyrbazu Sh. Epidemiology of cutaneous leishmaniasis in the border villages of

- Sarakhs city. Journal of Shahid Sadoughi University of Medical Sciences and Health Services. 2004: 30-35.
26. Dan H, Humes D. Essentials of internal medicin. 2001; 39(3):72-166.
27. Dehghani Tafti A, Hanafi Bajd AA, Jafari R, Ehrampoush MH. Cutaneous leishmaniasis in Ardakan city. J Shaheed Sadoughi Univ Med Sci. 1993; 11(1 Suppl 4): 22-28.
28. Kubeyinje EP, Belagavi CS, Jamil YA. Cutaneous leishmaniasis in expatriates in northern Saudi Arabia. East Afr Med J. 1997; 74(4): 249-251.
29. Desjeux P. Leishmaniasis. Nat Rev Microbiol. 2004; 2(9): 692-693.