



# A survey on epidemiology of leishmaniasis in Khatam, Iran during 2008-2012

Farokh Legha Servat<sup>1</sup>, Tahereh Soltani<sup>2</sup>, Zahra Derakhshan<sup>3\*</sup>, Najmeh Khanjani<sup>4</sup>, Akram Sadat Hosseini<sup>4</sup>, Zynab Anbari Nogyni<sup>4</sup>

<sup>1</sup>MSc Student in Health Education, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

<sup>2</sup>MSc in Health Education, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

<sup>3</sup>PhD Student of Environmental Sciences and Technology Research Center, Department of Environmental Health Engineering, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

<sup>4</sup>BS in Public Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

## Abstract

**Background:** Leishmaniasis is a parasitic disease, that due to the incidence, dissemination and scattering throughout different parts of Iran is of paramount importance. This study was carried out with the aim of determining the epidemiology of leishmaniasis cutaneous in Khatam during 2008-2012.

**Methods:** This is a cross-sectional and retrospective study of collected demographic and epidemiological information, related to 760 patients with the disease who underwent treatment in health centers in Khatam during 2008-2012. This information was analyzed using SPSS version 16 software and includes the history of disease outbreak, age, sex, place of residence, number of wounds, wound placement and a history of travel to endemic areas in the past year.

**Results:** The results showed that out of a total number of patients with cutaneous leishmaniasis 460 persons were male (60.5%) and 300 persons were female (39.5%); age mean of patients was  $22 \pm 1.68$ . The 0-9 years age group was more susceptible to the disease. The lodging for 525 subjects (69.1%) was listed as village, 224 (29.7%) of them lived in the city and 11 people (1.4%) lived on the fringes of the city. 98.8% of these patients were infected with rural cutaneous leishmaniasis. There were 428 cases of wounds on the hands (56.3%) making it the most common type.

**Conclusion:** The rural leishmaniasis is one of the major health problems of Khatam, and given the high disease incidence in children and farmers, continuing education on the care and control of the disease in the region is of very high importance.

**Keywords:** Epidemiology, Leishmaniasis, Cutaneous, Parasitic Diseases, Khatam city, Iran

**Citation:** Servat FL, Soltani T, Derakhshan Z, Khanjani N, Hosseini AS, Anbari Nogyni Z. A survey on epidemiology of leishmaniasis in Khatam, Iran during 2008-2012. Environmental Health Engineering and Management Journal 2016; 3(3): 159–163. doi: 10.15171/EHEM.2016.15.

## Article History:

Received: 25 June 2016

Accepted: 8 August 2016

ePublished: 29 August 2016

## \*Correspondence to:

Zahra Derakhshan

Email: derakhshan63@ssu.ac.ir

## Introduction

Leishmaniasis is a parasitic disease caused by various species of *Leishmania* in humans, meat eaters and rodents. This disease is a major health problem, common in 8 countries around the world (1), which causes enormous financial burden and loss of life. According to the investigation carried out on 29 known *Leishmania* species, 17 species are common between humans and animals (2). According to the World Health Organization (WHO) reports, leishmaniasis is endemic in 98 countries, meaning 12 million people worldwide are infected and about 350 million people are at risk of infection (3).

The annual incidence of new cases is about 2 million people that 5.1 million of them are suffering from leishmaniasis cutaneous (4). Furthermore, over 90% of cutaneous leishmaniasis cases are in Afghanistan, Algeria, Saudi Arabia, Iran, Syria, Bolivia, Brazil, Colombia, Nicaragua and Peru. Additionally, cutaneous leishmaniasis in some

countries such as Afghanistan, Venezuela, Pakistan and Turkey is on the rise (5), so that after malaria, leishmaniasis is of secondary importance. Cutaneous leishmaniasis is an endemic disease in most parts of the country and species of *Leishmania tropica* and *Leishmania major* are causes for cutaneous leishmaniasis (6). Despite the growing advances in the control of human diseases, leishmaniasis is still a major health problem. The WHO, has recognized the importance of this disease in terms of human health, and has listed it as one of six important diseases in tropical and subtropical regions (7,8). About 20 000 cases of cutaneous leishmaniasis are estimated annually in different parts of Iran and the actual number is believed to be more than this. This disease, due to its high prevalence, spread and dispersion in different parts of Iran is of paramount importance (9,10).

Based on recent studies conducted by researchers at the Health Research Institute, Faculty of Health in Tehran



University, this disease has been observed in various parts of Iran. In 2008, more than 26000 cases of cutaneous leishmaniasis, with an incidence rate of 37 per 100 000 people were recorded in Iran, this number dropping in 2010 has to 20593 cases with the incidence rate of 28 per 100 000 people. More than 90% of cases have occurred in 88 cities of the country and disease transmission has happened in 17 provinces. Up to now, two types of cutaneous leishmaniasis have been recognized. In the urban type which is famous for dry leishmaniasis, its reservoir are dogs and humans. In the rural type which is known as wet leishmaniasis, rats are the disease reservoir and its ulcers usually remain for between a few weeks to 6 months and a maximum of 18 months. Although the disease is common throughout the year, complaints of its pain peaks in fall season.

In many provinces, especially in rural areas, rural cutaneous leishmaniasis account for more than 70% of cases, and in the large and medium cities, urban cutaneous leishmaniasis is common. In 2010, the cities Shiraz, Mashhad, Isfahan as well as provinces Golestan, Kerman, Khuzestan, Ilam, Yazd, Sistan and Baluchestan, Tehran, Qom, North Khorasan, and Bushehr had the highest rate of infection. Amounting to 80% of cutaneous leishmaniasis in Iran are rural leishmaniasis (9).

Leishmaniasis has been studied in Yazd province during the years 1997-2001. The prevalence of the disease has been investigated for each of the months and seasons, gender segregation and age combination. In accordance with research by Dehghani and colleagues, the incidence rate of 170 people out of 100 000 people it has been in the first place of infection in 1988 (11). Given that there is no effective and secure vaccine for this disease, and that screening and treatment of all patients suffering from cutaneous leishmaniasis reduces incidence, size of scar and complications from cutaneous leishmaniasis, it seems that the disease can be controlled by conducting epidemiological studies that evaluate the risk factors of spreading the disease and improving preventative and control measures. With regard to the endemic nature of the disease in Khatam in Yazd province, we decided to conduct a study aiming to determine the prevalence of cutaneous leishmaniasis in the city of Khatam during 2008-2012.

## Methods

This study is cross-sectional and retrospective research. The statistical population is all those who have been treated from April 2008 through 2012 with a diagnosis of cutaneous leishmaniasis and clinical and laboratory confirmation of it in health centers around Khatam city. Their information has been recorded by the staff of these centers in the forms containing summary of leishmaniasis epidemiological data. In this study, information related to 760 patients with this type of disease was extracted from their records. The information includes the date of incidence of disease, age, sex, place of residence, the number of wounds, scar and a history of travel to endemic areas during the last year. The data was analyzed using SPSS

version 16 software.

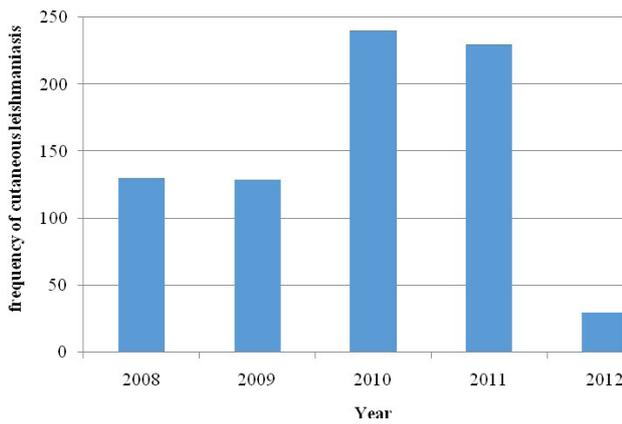
## Results

The results showed that out of the total number of patients with cutaneous leishmaniasis 460 persons were male (60.5%) and 300 persons were female (39.5%); mean age of patients was  $22 \pm 1.68$ . The 0-9 years old group was more susceptible to the disease. The lodging for 525 subjects (69.1%) was listed as village, 224 (29.7%) of them lived in the city and 11 people (1.4%) lived on the fringes of the city. In general, 582 people had a history of travel in the last year. They have mostly traveled to rural areas (agricultural wells). According to the conducted survey, 95% of the patients have no scar and 89% of lesion shapes were the wet type. Most of the lesions were on hands and the lowest lesion on the trunk (anterior and posterior of the trunk). The obtained results showed that out of the total patients, 42.2% have one wound and 19.6% have had four or more wounds (Table 1).

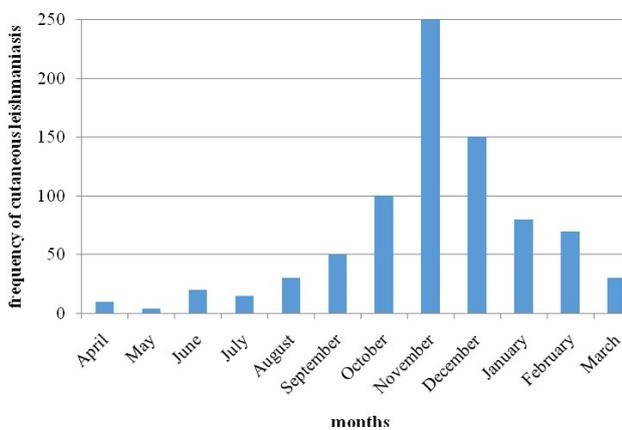
The highest prevalence of cutaneous leishmaniasis amongst various jobs was in farmers and ranchers. Additionally, according to the obtained results, correlation between year and month is statistically significant ( $P < 0.001$ ), so that the majority of patients were in the years 2010 and 2011 respectively and in November the highest (27.1%) and in May the lowest (0.2%) percentage of the patients were observed (Figures 1 and 2).

**Table 1.** The frequency of patients with cutaneous leishmaniasis in Khatam in 2008-2012

Variable	Number (%)
<b>Sex</b>	
Male	460 (60.50)
Female	300 (39.50)
<b>Job</b>	
Worker	81 (10.70)
Housewife	123 (16.20)
Student	138 (18.20)
Farmer and rancher	156 (5.20)
Employee	9 (2.10)
Other	135 (8.17)
<b>Number of wounds</b>	
1	317 (42.2)
2	182 (24.2)
3	105 (14)
4	54 (7.2)
More than four	93 (12.4)
<b>Time of Diagnosis</b>	
Less than one year	207 (27.20)
1 month	238 (44.50)
2 months	117 (4.15)
3 months	46 (1.60)
4 months	20 (6.20)
5 months	8 (1.10)
6 months	3 (0.40)
More than 6 months	13 (0.70)
<b>Residence</b>	
Rural	525 (69.10)
Urban	224 (29.50)
Suburbs	11 (1.40)



**Figure 1.** The frequency of cutaneous leishmaniasis infections for the years 2008-2012.



**Figure 2.** The frequency of cutaneous leishmaniasis shown by month for the years 2008-2012.

The results showed that the relationship between age and time of diagnosis was significant ( $P < 0.001$ ) and there was also significant relationship between age and history of scar ( $P < 0.001$ ). There was no significant relationship between sex and sickness ( $P = 0.2$ ) (Table 2).

**Discussion**

In this study, most rural zoonotic disease outcomes are related to rodents and in 2012 due to activities against rodents and floods in the studied areas, destruction of rodent nests lead to the rate of incidence of disease being widely reduced. It has been noted that 66.18% of disease incidences occurred in the fall. According to the species sand fly (vector) in this area is justifiable and most cases of the disease occur in November. The results conformed with similar studies in other parts of the country (12).

According to incubation period (2 weeks-2 months), it is expected that ulcer occurrence is often in the fall. Thus to prevent disease in the summer and early fall, effective preventive action of sand fly bites must be taken.

The results of this study showed that the incidence rate in men is more than in women, that this would be due to a variety of reasons, including mens' jobs (farming, animal husbandry), particularly in rural areas, as well as the type of clothing worn during work and rest. Men are more susceptible to bites and infection by sand flies. In a study in Pakistan 56.6% of infected persons were men. This confirms the results of our study. There was no significant relationship between infection and gender, and so in this regard, it is consistent with the results of studies by Karimi-Zarchi et al (13) in Sarakhs. It is not compatible with the studied conducted by Hamzavi et al (14,15) and Mohammadi et al in Damghan (16).

Another important factor in leishmaniasis infection is the age of the individual. In this study, the age mean of patients was  $22 \pm 1.68$  years old. In this study there was a significant relationship between age and incidence of disease, and these results are consistent with a study conducted in Damghan (16). There was a significant relationship between age and scar history. In most cases, patients in this study fell in the 0-9 years old group, and the higher the age the fewer incidences of the disease were observed. The incidence of disease decreases, probably due to acquired immunity, and these results correspond with other studies (17,18). A study done in Khatam city by Barati et al in 2015, suggested that among a total of 1775 cases of cutaneous leishmaniasis, most of the cases were in the age group of 10-30 years and most of these cases were men (61%). Barati et al also concluded that cutaneous leishmaniasis disease is a major health problem in the Khatam town. So it is necessary to plan for controlling disease and implementing appropriate measures in order to reduce the incidence of the disease. Measures such as health education and controlling disease reservoir, should be considered as disease control programs (19).

Whilst other studies, such as Marvdasht show the majority of incidences occurring within the 15-30 years age group (the active group of society) these studies suggest that the different results regarding age might be related to age groupings. The placement of wounds follows several factors, including species of sand flies, social and cultural behavior of individuals, weather and so on. In this study, most of the wounds have been reported on hands, feet and then face- corresponding with a study conducted by Sharifi et al in Kashan (20). In terms of the start of disease season, 66.18% occurred in autumn and in this case

**Table 2.** Distribution of cutaneous leishmaniasis in 2008-2012 according to sex

Sex	Year										Total	
	2008		2009		2010		2011		2012		No.	%
	No.	%										
Male	84	64.6	84	66.1	147	60.2	128	55.7	17	58.6	460	60.5
Female	46	35.4	43	33.9	97	39.8	102	44.3	12	41.4	300	39.5
Total	130	100	127	100	244	100	230	100	29	100	760	100

is justifiable with regard to the type of vector sand fly in the study area. The highest incidence of the disease has been reported in November and that is consistent with the results of similar studies in other parts of the country (14,21,22). One of the notable characteristics of rural zoonotic cutaneous leishmaniasis is the placement of wounds on hands and feet, as supported by other studies' results showing that the most frequent lesions (56.3) are on hands (14,21,22). Another notable result was the occurrence of multiple lesions, in some cases 10 or more, on one person. One explanation for the presence of multiple lesions could be the manner of sand fly feeding, another explanation could be an abundance of infected mosquitoes in a region (23-25). Given that the incubation period of the disease is two weeks to two months, and that ulcers are expected to occur mostly in autumn (thus consistent with the results of our research) we recommend effective preventive actions are made regarding sand fly bites to prevent disease in the summer and early autumn.

### Conclusion

Given that the highest percentage of patients have been farmers and ranchers and these people are often bitten by sand flies in the early evening, it is recommended that farmers wear appropriate clothing and stop their work before sunset. The rural leishmaniasis is one of the health problems of Khatam city, and given the high disease incidence in children and farmers, continuing education on the care and control of the disease in the region is of very high importance. Recognizing and identifying the types of parasite, vectors and disease reservoirs is an initial requirement in determining the correct way to cope with the disease - only then can an effective role be played in controlling it.

### Acknowledgments

The authors would like to thank the Research Vice-Chancellor of Yazd University of Medical Sciences for funding this study.

### Ethical issues

There were no ethical issues in the writing of this article.

### Competing interests

The authors declare that they have no competing interests.

### Authors' contributions

All authors participated in the design of this study, the final revision of manuscript and the analyzing of data. All authors have read and approved the final manuscript.

### References

- Kolodziej H, Kiderlen AF. Antileishmanial activity and immune modulatory effects of tannins and related compounds on *Leishmania* parasitised RAW 264.7 cells. *Phytochemistry* 2005; 66(17): 2056-71. doi: 10.1016/j.phytochem.2005.01.011.
- MohebAli M. Protozoal Zoonoses. 1st ed. Tehran: Nadi; 1976. p. 31-40. [In Persian].
- Rocha L, Almeida J, Macedo R, Barbosa-Filho J. A review of natural products with antileishmanial activity. *Phytomedicine* 2005; 12(6-7): 514-35. doi: 10.1016/j.phymed.2003.10.006.
- World Health Organization. WHO Technical Report Series 949: Control of the Leishmaniases, Report of a Meeting of the WHO Expert Committee on the Control of Leishmaniases, Geneva, 22-26 March 2010. WHO; 2010. doi: 10.2307/3283490; Available from: [http://apps.who.int/iris/bitstream/10665/44412/1/WHO\\_TRS\\_949\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/44412/1/WHO_TRS_949_eng.pdf)
- Desjeux P. Leishmaniasis: current situation and new perspectives. *Comp Immunol Microbiol Infect Dis* 2004; 27(5): 305-18. doi: 10.1016/j.cimid.2004.03.004.
- Saebi E. Parasitic Diseases in Iran: protozoan diseases. 4th ed. Tehran: Hayyan Cultural Institute Publishing; 2005. p. 313-83. [In Persian].
- World Health Organization. Leishmaniasis and Leishmania/HIV Co-Infection. WHO Report on Global Surveillance of Epidemic-Prone Infectious Disease. WHO/CDS/CSR/ISR; 2000. p. 121-127.
- Alvar J, Velez ID, Bern C, Herrero M, Desjeux P, Cano J, et al. Leishmaniasis world wide and global estimates of its incidence. *PLoS One* 2012; 7(5): e35671. doi: 10.1371/journal.pone.0035671.
- Islamic Republic of Iran Ministry of Health & Medical Education. Instruction of Leishmaniasis Control. Tehran: Center of Disease Control; 1999. Available from: [http://vch.iiums.ac.ir/uploads/ketab\\_salak.pdf](http://vch.iiums.ac.ir/uploads/ketab_salak.pdf). [In Persian].
- Nadim A, Azizi F, Janghorbani M, Hatam H. Epidemiology and control of common disorders in Iran. Tehran: Endocrine and Metabolism Research Center; 2000. p. 524-34. [In Persian].
- Dehghani-Tafti AA, Hanafi-Bajed AA, Jafari R, Ebrahim Poosh MH. Survey of the status of cutaneous Leishmaniasis in Ardakan county of Yazd: an area covered by the control program. *J Shaheed Sadoughi Univ Med Sci* 2003; 11(1): 22-8.
- Shamsodini S, Nikiyan Y, Yasami M, Ghazizadeh T. Leishmaniasis and its prevalence in immigrant and native students in primary schools in Kerman. *Teb Tazkiyeh* 1993; 3(2): 44-51. [In Persian].
- Karami-Zarchi A, Mahmoodzadeh A, Vatani H, Shirbazoo S. An epidemiologic study of cutaneous leishmaniasis (reservoirs and vectors) in border villages of Sarakhs in Khorasan province. *Arch Iran Med* 2005; 8(1): 73-6.
- Hamzavi Y, Mohebbali M, Edrisiyan G, Forozani A. An epidemiologic study of cutaneous leishmaniasis (infection of human and animal reservoirs). *Iran J Public Health* 2000; 29(1-4): 177-89. [In Persian].
- Hamzavi Y, Sobhi SA, Rezaei M. Epidemiological aspects of cutaneous leishmaniasis in patients recourse to health center in Kermanshah province in 2002-07. *J Kermanshah Univ Med Sci* 2009; 13(2): 151-61. [In Persian].
- Mohammadi Azni S, Nokandeh Z, Khorsandi A, Sanei Dehkordi AR. Epidemiology of cutaneous leishmaniasis in Damghan district. *Iranian Journal of Military Medicine* 2010; 12(3): 131-5. [In Persian].
- Talari SA, Vakili Z, Moshtaghi S. Prevalence of cutaneous leishmaniasis in Kashan, 1994-2000. *Feyz* 2003; 7(2): 71-6. [In Persian].
- Babaei GH, Shayan A. An epidemiological study of cutaneous leishmaniasis and the investigation of scars with

- emphasis on seasons, age and sex groups in Paalam, south of Lorestan province. *Armagan Danesh* 2003; 8(1): 51-7. [In Persian].
19. Barati H, Barati M, Lotfi MH. Epidemiological study of cutaneous leishmaniasis in Khatam, Yazd province, 2004-2013. *Paramedical Sciences and Military Health* 2015; 10(2): 1-5. [In Persian].
  20. Sharifi I, Fekri A, Aflatonian M, Nadim A, Nikian Y, Kamesipour A. Cutaneous leishmaniasis in primary school children in the south-eastern Iranian city of Bam, 1994-95. *Bull World Health Organ* 1998; 76(3): 289.
  21. Rassi Y, Javadian E, Jalali M, Motazedian M, Vatndoost H. Investigation on zoonotic cutaneous leishmaniasis, Southern Iran. *Iran J Public Health* 2004; 33(1): 31-5.
  22. Yaghoobi-Ershadi M, Hanafi-Bojd A, Akhavan A, Zahrai-Ramazani A, Mohebbali M. Epidemiological study in a new focus of cutaneous leishmaniasis due to *Leishmania major* in Ardestan town, central Iran. *Acta Tropica* 2001; 79(2): 115-21. doi: 10.1016/S0001-706X(01)00085-7
  23. Doroodgar A, Dehghani R, Afzali H, Taghavi Ardekani A, Hooshyar H. Study of human infection to cutaneous leishmaniasis (Salak) in northwest part of Kashan, 1999. 3th Parasitology Congress; Mazandaran Univ Med Sci; 2000. [In Persian].
  24. Killick-Kendrick R. Phlebotomine vectors of the leishmaniasis: a review. *Med Vet Entomol* 1990; 4(1): 1-24. doi: 10.1111/j.1365-2915.1990.tb00255.x