Iran J Public Health, Vol. 44, No.3, Mar 2015, pp.299-307

Review Article

A Comprehensive Review of Cutaneous Leishmaniasis in Kerman Province, Southeastern Iran- Narrative Review Article

Iraj SHARIFI [1], Mohammad Reza AFLATOONIAN [2], Ali Reza FEKRI [1], Maryam HAKIMI PARIZI [1], Abbas AGHAEI AFSHAR [1], Ahmad KHOSRAVI [1], Fatemeh SHARIFI [3], Behnaz AFLATOONIAN [4], Ali KHAMESIPOUR [5], Yahya DOWLATI [5], Farrokh MODABBER [6], Abolhasan NADIM [7]

1. *Leishmaniasis Research Center, Kerman University of Medical Sciences, Kerman, Iran*
2. *Research Center of Tropical and Infectious Diseases, Kerman University of Medical Sciences, Kerman, Iran*
3. *Pharmaceutics Research Center, Institute of Neuropharmacology, Kerman University of Medical Sciences, Kerman, Iran*
4. *Neuroscience Research Center, Kerman University of Medical Sciences, Kerman, Iran*
5. *Center for Research and Training in Skin Diseases and Leprosy, Tehran University of Medical Sciences, Tehran, Iran*
6. *Drugs for Neglected Diseases Initiatives (DNDi), 15 Chemin Louis-Dunant, Geneva, Switzerland*
7. *School of Public Health, Tehran University of Medical Sciences, Tehran, Iran*

***Corresponding Author:** Email: iraj.sharifi@yahoo.com

(Received 24 Aug 2014; accepted 14 Dec 2014)

Abstract

Background: Cutaneous leishmaniasis (CL) remains a serious public health concern in Kerman Province, eastern Iran. This study was aimed to conduct a comprehensive review and highlights various aspects of CL in the province of Kerman.

Methods: This article mainly focuses on the studies published in the past 26 years on CL in the province. Current data for the present status were obtained through the provincial health system.

Results: Bam was the most infected district (63.6%), followed by Kerman (24.7%) and other districts to a less extent. *Leishmania tropica* is the major causative agent (95.5%) of CL in Kerman province, however, *L. major* accounts for 4.5% of the total cases. Bam, Kerman and southern districts of Kerman province were purely anthroponotic CL (ACL), while Rafsanjan, Baft, and Sirjan showed both ACL and zoonotic CL (ZCL). In contrast, Orzoieh district was merely endemic to ZCL type. *Phlebotomus sergenti* was the main vector in ACL foci while *Ph. papatasi* was the major vector in the ZCL district of Orzoieh. Localized CL was the most prevalent form (80%) of the disease, while leishmaniasis recidivans was the most uncommon clinical manifestation (18.7%).

Conclusion: Due to recent rises in CL disease both in regard of increases in incidence rate and expansion of the disease to new foci, and presence of various risk factors in the province, control measures and health strategies should have high priorities to help treat the existing cases and prevent the expansion of the disease to new areas.

Keywords: Cutaneous leishmaniasis, *Leishmania tropica, Leishmania major,* Iran

Introduction

Leishmaniasis is among the ninth important infectious diseases in terms of mortality and morbidity (1). The incidence rate of CL is increasing and geographical distribution of the disease is expanding to new foci, due to the presence of various risk factors including population growth and displacement, urbanization, anthropogenic environmental modifications, human behaviors, drug resistance, and new agricultural practices (2-9). The preliminary study on CL goes back to 1976 in Kerman Province, where Yaghoobi-Erashadi carried out a house-to-house survey and visited 820

individuals in high-risk areas in city of Kerman. He reported an active lesion of 7.8% and scar rate of 18.7%. However, the findings could not be generalized to the total population (10). During 1980-1981, Seyedi–Rashti and colleagues reported the trend of urban CL among 35,000 children in 77 elementary and 36 junior high schools in Kerman City. The overall prevalence rate of the active lesion was 0.8% and the scar rate was 4.4%. These authors reported more than 95% of indoor sand flies to be of *Ph. sergenti* species (11). Later on, in 1993 for the first time, Nadim and Aflatoonian reported ACL from the district of Bam where more dimensions of the disease have currently been elucidated (12).

Cutaneous leishmaniasis epidemiology has been significantly changing with the occasional incidence fluctuation in Kerman province, owing to the presence of general and much more specific risk factors caused by recent, man-made precipitating determinants. At present, in light of the introduction of much more modern, refined, and sophisticated techniques, extensive and profound studies have been carried out in various aspects of the disease related to the causative agents, demographic characteristics, reservoirs, biological vectors, and control approaches. Several studies on vaccine efficacy (13-15), treatment modalities (16-17) and implementation of control measures (12, 18-20) have been completed in high endemic areas of the province.

The present study is aimed to review historically various aspects of CL in Kerman province, where all three species of the old world leishmaniasis coexist in complex foci in diverse epidemiological settings of Kerman province. Anthroponotic CL (ACL) was more common with a considerable public health impact in some parts of the province, in which human and *Ph. sergenti* were reservoir host and biological vectors, respectively (21-25). Zoonotic CL (ZCL) caused by *L. major* is present in lower incidence rate and coexisted with *L. tropica* in some foci (25-27). *Rhombomys opimus* gerbils were the principal reservoir and *Ph. papatasi*, the main sand fly vector (28). *L. infantum* is endemic in southwestern Orzoieh district in Kerman province and have been sporadically reported throughout the province, but not included in here.

Overview of the study

This review was mainly focused on the studies published in the past 26 years on CL in the province of Kerman, southeast of Iran. For this purpose, a comprehensive literature review of local and international databases were conducted using *Leishmania* species, cutaneous leishmaniasis (CL), in Kerman, Iran. Since CL in Kerman province is a notifiable disease and its management is integrated in the primary health care (PHC) system, data in the status (2011-2013) were obtained through the provincial health system. Data for the present situation was not available for district of Rafsanjan.

There was no comprehensive report on CL in Kerman province. In the current paper, various aspects of control strategies including prevention, control approaches, and case- management were considered, described and discussed. The experience gained in the course of sustained and prolonged ACL epidemic following the earthquake of 2003 in Bam is potentially important as well as practically in order to develop a control program and also in management of the disease, especially in CL endemic regions.

Kerman Province

Presently, Kerman is the largest province of Iran, with the population of 2.7 million, which consists one fourth of fruit trees of the country including pistachios in north and north-west, orchards of oranges and various crops in south, and palm trees with fruitful dates in Bam. The province covers an area of 181,714 km^2 and is located in the Southeastern part of the country. The province consists of 23 districts and the CL has historically been present in Bam and Kerman districts. In recent years, the disease has been expanded and spread to new foci throughout the province. The climate is extraordinarily variable, which makes it unique, depending upon the relief of the land. The climate in north and northwestern areas is fairly moderate and dry while in the south and southeast, the weather is warm and humid. The altitude var-

ies between 300 m above sea level in Manujan district to about 2,600 m in Baft.

Diagnostic methods

Skin scrapings from the periphery of the lesions were obtained, smeared on glass slides, fixed with methanol, stained by Giemsa, and observed under a compound light microscope. The diagnosis was confirmed by direct examination of all cases and in many cases, cultured in NNN and / or RPMI1640 media.The identity of *Leishmania* species was determined by indirect fluorescent antibody test (IFAT) and/or enzyme-linked immunosorbent assay (ELISA) using monoclonal antibodies (mAb), conventional- PCR, nested – PCR or real- time PCR. In a few instances, inoculation of mice was used for biological confirmation of *L.major* or isoenzyme to identify *Leishmania* species and strains, respectively.

Prevention and control strategies

A combination of control approaches has been applied. ACL clinic has been established to coordinate various activities to control and treat ACL in Bam. These measures have included training teams of health personnel for health education, diagnosis of the cases, and identification of the causative agent, active and passive case-detection, treatment and implementation of control measures (16-20, 29). Since CL is a notifiable disease in Kerman province, cases are found by passive case-detection through health surveillance system, exception being for Bam, where all CL cases are detected by both active and passive strategies.

Personal and environmental measures

Spraying insecticide residuals, application of insecticide-impregnated nets (19-20), and personal protection measures are other control strategies, which have been used to diminish the extent of the CL epidemic, especially in Bam district. Various measures have been implemented to control the cases where the disease was endemic or epidemic, particularly in emerging foci such as Dehbakri and Nezambabad counties in Bam (30,31), Mohammadabad county in Jiroft (24) and in rural communities of Orzoieh district (6,26,32).

A face–to–face health education program has been conducted in a large scale for public and schoolchildren (33). Each individual referring to the CL clinic was given a stick repellent impregnated with diethyl toluamide (DEET) and the lesions were dressed. In addition, the installation of deltamethrin-impregnated screens and curtains has been assessed as a preventive measure against *Ph. sergenti* in Bam (19-20). Improving housing conditions, land clearance around human dwellings, insecticide spraying in high-risk areas and removal of million tons of debris and rubbles were other measures for environmental management (34).

Treatment

Meglumine antimoniate (Glucantime) is the first-line treatment for CL, either systemically or intralesionally (35). National guideline for the treatment strategies of CL includes cryotherapy in combination with glucantime. Various modalities are used in endemic areas including CO_2 laser was also used to treat ACL patients; occasionally it was more effective in treating ACL than combined cryotherapy along with intralesional glucantime (17). For the treatment of leishmaniasis recidivans, glucantime along with allopurinol were used with a cure rate of over 90% (16). The prevention and treatment costs were significantly lower than the cases in other CL endemic countries (36, 37).

Results

Bam was the most widely infected district (63.6%), followed by Kerman City (24.7%), and other districts were sporadically affected (Table 1). The most prevalent form of CL in Kerman province was ACL caused by *L. tropica*, which was mainly endemic in Bam, although the sporadic cases of *L. major* have already been reported in rural areas (Table 2) (25,38,39). Two different isoenzyme of *L. tropica* (39); MON-39 (77.8%) and MON-55 (22.2%) have been previously reported. After the earthquake in Bam, the epidemics of ACL occurred in the city and rural areas of Bam, where the cases significantly increased, steadily from 2003 (1% incidence) to 2.5% in the peak epidemic in 2006 (three years after the earthquake) (40-41).

Table 1: Mean annual geographical distribution of cutaneous leishmaniasis cases by district in Kerman province, South-eastern Iran, 2011-2013

District	2011	2012	2013	Mean no. (%)
Bam	1203	876	685	921.3(63.6)
Kerman	255	349	468	357.3(24.7)
Jiroft	37	86	87	70.0(4.8)
Baft	47	22	11	26.7(1.8)
Sirjan	24	23	22	23.0(1.6)
Rodbar-e-Junoob	19	9	8	12.0(0.8)
Shahr-e-Babak	16	4	10	10.0(0.87)
Bardsir	13	4	1	6.0(0.4)
Ghal-e-Gang	11	5	2	6.0(0.4)
Anbarabad	6	5	3	4.7(0.3)
Zarand	0	8	3	3.7(0.3)
Kahnooj	1	1	4	2.0(0.1)
Ravar	1	1	4	2.0(0.1)
Kohbanan	1	1	2	1.3(0.09)
Rabbor	1	1	1	1.0(0.07)
Manujan	1	1	1	1.0(0.07)
Total	1636	1396	1312	1448.0(100.0)

A similar pattern of incidence risk was observed among opium addicts and non-opium addicts in seven years follow-up examinations in Bam (42). The epidemics of ACL occurred in two counties within Bam district; Dehbakri (31) and Nezamabad (30), and Mohammadabad County (24) in Jiroft after the earthquake.

The current data indicated (Table 2) that CL in Kerman district was predominantly of ACL type (97%), although *L .major* was reported to a less extent (3%). Similarly, the majority of the cases occurred in southern districts was ACL. In three districts of Rafsanjan, Baft, and Sirjan ZCL caused by *L .major* and ACL caused by *L. tropica* co-exist (25, 43). The type of CL in Orzoieh district was purely *L. major* (6,26,27,32), as indicated in Table 2. In line with the CL cases in the province, *Ph. sergenti* was the major biological vector (range; 80.3%-94%) in city of Bam (21-22) and the predominant phlebotomine species was *Ph. papatasi* in Orzoieh (27) and Rafsanjan districts (44) (Table 3). Methods for discriminating the sand fly vectors were microscopy for the city of Bam (19,21) and Bahreman County in Rafsanjan (44) , while microscopy (26) and PCR based method for Orzoieh (27) and real-time PCR coupled with high resolution melting curve for Dehbakri County in Bam (22).

The anatomical location of lesions significantly varied in ACL patients compared to ZCL cases. The majority of lesions were single and located on face (60%), followed by hands, legs, and other parts (40%) before the earthquake in Bam. On the other hand, the location of lesions was significantly changed to hands, legs (70%), face, and other locations after the earthquake in Bam (25, 40, 41, 45). When the anatomical location of the lesions was considered in ACL endemic districts such as Kerman or other southern districts, females were more significantly infected than the corresponding males. The reason for such a difference has not been well described. In ZCL endemic foci, extremities were more significantly infected (6, 26, 32).

In the province, ACL cases reported from all age groups throughout the year, although children in colder seasons contracted the disease more frequently than older individuals did. However, in ZCL areas of Rafsanjan, Orzoieh, Sirjan, or Baft, extremities (hands and legs) were more commonly and equally involved in children of both sex (6,25,26,35).

Table2: Geographical distribution of cutaneous leishmaniasis species by district, method of identification and causative agent in Kerman province, South-eastern Iran, 2011-2013

Place/Year	Method	Species (%)	Reference
Bam			
City 1994-1997	Isoenzyme	*L.tropica* MON-39(77.8) *L.tropica* MON-55(22.2)	39
1995-1998	IFAT-mAb & ELISA-mAb	*L.tropica*(91.1) *L.major* (8.95)	39
1995-1998	IFAT-mAb & ELISA-mAb	*L.tropica*(78.3) *L.major* (21.7)	38
Dehbakri-County 2008	PCR	*L.tropica*(100)	46
District 2004-2010	Nested- PCR	*L.tropica*(100)	42
2009-2010	Nested- PCR	*L.tropica*(100)	8
2011	Real-time PCR	*L.tropica*(100)	22
District 2008-2010	Nested- PCR	*L.tropica*(100)	25
District 2011-2012	Nested- PCR	*L.tropica*(100)	31
District 2011-2012	ITS-PCR	*L.tropica*(100)	23
Nezamabad-County /2010	PCR	*L.tropica*(100)	30
Kerman			
City 1995-1998	IFAT-mAb	*L.tropica*(97) *L.major* (3)	43
2008-2010	Nested- PCR	*L.tropica*(100)	25
Rafsanjan			
District 1995-1998	IFAT-mAb	*L.tropica*(90.1) *L.major* (9.9)	43
Bahreman-County 2006	PCR & Mice inoculation	*L.major* (100)	28
Orzoieh			
District /1998	IFAT-mAb & ELISA-mAb & Mice inoculation	*L.major* (100)	32
District 2003-2004	RAPD-PCR	*L.major* (100)	26
District 2011-2012	Nested- PCR	*L.major* (100)	6
Jiroft-District 2008-2010	Nested- PCR	*L.tropica*(100)	25
Baft-District 2008-2010	Nested- PCR	*L.tropica*(76.9) *L.major* (23.1)	25
Sirjan-District 2008-2010	Nested- PCR	*L.tropica*(53.8) *L.major* (46.2)	25
Shahr-e-Babak-District 2008-2010	Nested- PCR	*L.tropica*(100)	25
Kahnooj-District/2008-2010	Nested- PCR	*L.tropica*(100)	25
Roodbar-e-jonoob- District 2008-2010	Nested- PCR	*L.tropica*(100)	25
Ghal-e- Ganj-District/2008-2010	Nested- PCR	*L.tropica*(100)	25
Anbarabad-District/2008-2010	Nested- PCR	*L.tropica*(100)	25
Zarand-District/2008-2010	Nested- PCR	*L.tropica*(100)	25
Bardsir-District/2008-2010	Nested- PCR	*L.tropica*(100)	25

Table 3: Geographical distribution of cutaneous leishmaniasis vector in Kerman province, south-eastern Iran, 2011-2013

Place/Year	Vector (%)	Method	Reference
Bam			
City 1994	*Ph. sergenti* (95) *Ph. papatasi* (5)	Microscopy	19
City 1998	*Ph. sergenti* (80.3) *Ph. papatasi* (19.7)	Microscopy	21
Dehbakri -County/ 2011	*Ph. sergenti* (100.0)	HRM*	22
Orzoieh			
District 2003-2004	*Ph. papatasi* Indoor (90.3) Outdoor (50.2)	Microscopy	26
District/ 2005	*Ph. papatasi* (100)	PCR	27
Rafsanjan –Bahreman County	*Ph. papatasi* Indoor (87.1) Outdoor (57.2)	Microscopy	44

*Real – time PCR coupled with high resolution melting

Fig. 1: Clinical manifestation of anthroponotic cutaneous leishmaniasis patients in Kerman province. A; localized cutaneous leishmaniasis. B; leishmaniasis recidivans lesions with active papule on the face. C; leishmaniasis recidivans showing scar of an old cutaneous leishmaniasis lesion on the left with active papule on the right (Fig B and C are taken from reference 46)

The duration of ACL cases was frequently around 8 to 10 months, but for uncommon clinical presentation, it might last for a few years (46).CL may evolve into several clinical forms; localized CL (LCL) is the most prevalent form for 95% of the cases (unpublished data). The first sign of infection is a small erythema, which develops to a papule after a variable prepatent period at the site of sand fly bite. Then, the papule progresses into nodule, ulcer, recovery stage, and eventually leave a permanent depressed scar as the characteristic of LCL (unpublished data). The duration of lupoid lesion varies from 2 to 8 years and diameter of the lesion was 1-5 cm with yellowish-brown appearance with papules around or in the scar. Most of the lesions (95%) were on the face and more frequent in males than females (Fig. 1). However, a few cases of other clinical presentations (<2%) including sporotrichoid, erysipeloid, zosteriform, or eczematoid lesions were seen (unpublished data).

Conclusion

The present rise in the number of cases along with unprecedented epidemics and emergences strongly suggests that health authorities should consider CL as an important public health problem with variable morbidity impacts. A comprehensive surveillance,

including active and passive case-finding approaches, along with the prompt detection of causative agent, and immediate treatment of the patients should receive high priority. Furthermore, due to the presence of various risk factors including non-immune individuals, anthropogenic ecological disturbances, population growth and displacement, industrial development, occurrence of man-made and natural disasters and drug resistance, it is crucial to plan future control strategies and public health measures to help treat active lesions to prevent the expansion of the disease to new areas.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

Acknowledgments

The authors would like to express sincere thanks to the health personnel in Kerman Province in collecting the preliminary data and all partners who contributed information and added to the scientific merit of this review. The authors declare that there is no conflict of interests.

References

1. Alvar J, Velez ID, Bern C et al. (2012). Leishmaniasis worldwide and global estimates of its incidence. *PloS One,* 7: e 35671.
2. Ashford RW (2000). The leishmaniasis as emerging and reemerging zoonoses. *Int J Parasit*, 30: 1269–1281.
3. 3-Daszak P, Cunningham AA, Hyatt AD (2001). Anthropogenic environmental change and the emergence of infectious diseases in wildlife. *ActaTropica*, 78: 103-116.
4. Desjeux P (2001). The increase in risk factors for the leishmaniasis worldwide. *Trans Roy Soc Trop Med Hyg*,95: 239–243.
5. Jeddi F, Piarroux R, Mary C (2011). Antimony resistance in *Leishmania*, focusing on experimental research. Journal of Tropical Medicine. http://dx.doi.org/10.1155/2011/695382.
6. Khosravi A, Sharifi I, Dortaj E et al. (2013). The present status of cutaneous leishmaniasis in a recently emerged focus in South-west of Kerman Province, Iran. *Iran J Public Health*, 42(2):182-7.
7. Patz JA, Graczyk TK, Geller N et al. (2000). Effects of environmental change on emerging parasitic diseases. *Int J Parasitol*, 30: 1395-1405.
8. Pour R, Sharifi I, Kazemi B (2011). Identification of nonresponsive isolates to Glucantime in patients with cutaneous leishmaniasis in Bam. *J Kerman Univ Med Sci*, 18 (2): 123-133.
9. World Health Organization (WHO) (2010).Control of the leishmaniasis Report of a Meeting of the WHO Export Committee on the Control of Leishmaniasis , *WHO Technical Report Series 949,* Geneva pp. 1-187.
10. Yaghoobi-Ershadi MR (1977). Cuteneous leishmaniasis in Kerman, MSPH theses, School of Public Health No, 672.
11. Seyedi-Rashti MA, Keighobadi K, Nadim A (1984). Urban cutaneous leishmaniasis in Kerman, Southeast Iran. *Bull Soc Path Ex*, 77: 312-319.
12. Nadim A, Aflatoonian MR (1995). Anthroponotic cutaneous leishmaniasis in Bam, southeast Iran. *Iran J Public Health*, 24:15–24.
13. Noazin S, Modabber F, Khamesipour A et al. (2008). First generation leishmaniasis vaccines: A review of field efficacy trials.*Vaccine*, 26(52): 6759–6767.
14. Noazin S, Khamesipour A, Moulton LH, et al. (2009). Efficacy of killed whole-parasite vaccines in the prevention of leishmaniasis—A meta-analysis. *Vaccine*, 27(35): 4747–4753.
15. Sharifi I, Fekri AR, Aflatoonian MR et al. (1998). Randomized vaccine trial of single dose of killed *Leishmania major* plus BCG against anthroponotic cutaneous leishmaniasis in Bam, Iran. *Lancet*, 351: 1540–1544.
16. Esfandiarpour I, Dabiri SH (2007). Treatment of cutaneous *leishmaniasis recidivans*with a combination of allopurinol and meglumineantimoniate: a clinical and histologic study. *Int J Dermatol*, 46: 848–852.
17. ShamsiMeymandi S, Zandi S, Aghaie H, Heshmatkhah A (2011). Efficacy of CO_2 laser for treatment of anthroponotic cutaneous

leishmaniasis, compared with combination of cryotherapy and intralesionalmeglumineantimoniate. *J EurAcadDermatolVenereol*, 25 (5): 587–591.
18. Aghaei Afshar A, Vatandoost H, Sharifi I et al. (2013). First determination of impact and outcome indicators following indoor residual spraying (IRS) with deltamethrin in a new focus of anthroponotic cutaneous leishmaniasis (ACL) in Iran. *Asian Pac J Trop Dis*,3: 5-9.
19. Nadim A, Motabar M, Houshmand B et al. (1995). Evaluation of pyrethroid impregnated bed nets for control of anthroponotic cutaneous leishmaniasis in Bam (Islamic Republic of Iran. World Health Organization /Leish/95.37 Geneva.1995).
20. Noazin S, Shirzadi MR, Kermanizadeh A et al. (2013). Effect of large-scale installation of deltamethrin-impregnated screens and curtains in Bam, a major focus of anthroponotic cutaneous leishmaniasis in Iran. *Trans Roy Soc Trop Med Hyg*, [Published online 2013]. doi: 10.1093/trstmh/trstmh/trt036.
21. Aghasi M, Sharifi I (2003). Survey of the fauna and monthly activity of the sand fly as the vector of the cutaneous leishmaniasis in the city of Bam. *J Kerman Univ Med Sci*, 10: 85–91.
22. Aghaei AA, Rassi Y, Sharifi I et al. (2014). First report on natural *Leishmania* infection of *Phlebotomussergenti* due to *Leishmania tropica* by high resolution melting curve method in South-eastern Iran.*Asian Pac J Trop Med*, 7(2):93-6.
23. Ghatee MA, Sharifi I, Mirhendi H et al. (2013). Investigation of double-band electrophoretic pattern of ITS-rDNA region in Iranian isolates of *Leishmania tropica*. *Iran J Parasitol*, 8(2):264-272.
24. Mirzaei M, Sharifi I, Poursmaelian S (2012). A new focus of anthroponotic cutaneous leishmaniasis and identification of parasite species by nested PCR in Jiroft, Iran. *CompClinPathol*, 21(5): 1071-1075.
25. Sharifi F, Sharifi I , Zarean M et al. (2011). Spatial distribution and molecular identification of *Leishmania* species from endemic foci of south – eastern Iran. *Iran J Parasitol*, 7:45-52.
26. Akhavan AA, Yaghoobi-Ershadi MR, Hasibi F et al. (2007). Emergence of cutaneous leishmaniasis due to *Leishmania major* in a new focus of southern Iran. *Iran J Arthropod-Borne Dis*, 1:1–8.
27. Oshaghi MA, Yaghobi-Ershadi MR, Abbassi M et al. (2008). Detection of *Leishmania major* in naturally infected sand flies using semi nested-PCR. *Iran J Publ Health*, 37(4): 59-64.
28. Ghaffari D, HakimiParizi M, Yaghoobi- Ershadi MR et al. (2014). A survey of reservoir hosts in two foci of cutaneous leishmaniasis in Kerman province, southeast of Iran. *J Parasit Dis*, 38 (3): 245-249.
29. Aghaei Afshar A, Rassi Y, Sharifi I et al. (2011).Susceptibility status of *Phlebotomuspapatasi* and *P. sergenti* (Diptera: *Psychodidae)* to DDT and Deltamethrin in a focus of cutaneous leishmaniasis after earthquake strike in Bam, Iran. *Iran J Arthropod- Borne Dis*,32-41.
30. Aflatoonian MR, Sharifi I, Poursmaelian S et al. (2013). The emergence of anthroponoticcutaneous leishmaniasis following the earthquake in southern villages of Bam district, southeastern Iran, 2010. *J Arthropod-Borne Dis*, 7: 8-14.
31. Sharifi I, Poursmaelian S, Aflatoonian MR et al. (2011). 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*, 16: 510–513.
32. Sharifi I, Zamani F, Aflatoonian MR, Fekri A R(2008). An epidemic of cutaneous leishmaniasis in Baft district in Kerman province and its probable causative risk factors. *Iran J Epidemiol*, 1: 53-58.
33. Aflatoonian MR, Sharifi I (2011). The epidemiology of cutaneous leishmaniasis in the city and suburb of Bam in 2010: active case-finding, treatment and health education of the school children. *Iran J Epidemiol*, 7:52-57.
34. Abolghasemi H, Radfar MH, Khatami M et al. (2006). International medical response to a natural disaster: lessons learned from the Bam earthquake experience. *Prehosp Disaster Med*, 21:141-147.
35. Shirzadi MR, Gouya MM (2012). National Guidelines for cutaneous leishmaniasis surveillance in Iran. Ministry of Health and Medical Education (MOH). Zoonoses Control Department, Tehran Iran pp: 1-78.
36. Aflatoonian MR, Sharifi I, Abbasi R et al. (2010). To evaluate the cost of prevention on inci-

dence of cutaneous leishmaniasis due to earthquake in Bam. *Iran J Epidemiol*, 6: 32-38.
37. Aflatoonian MR, Sharifi I, Fekri AR (2009). Evaluation of the cost-effectiveness of cutaneous leishmaniasis treatment after the earthquake. *J Kerman Univ Med Sci,* 4: 365-373.
38. Ardehali S, Moattari A, Hatam GR et al. (2000). Characterization of *Leishmania* isolated in Iran: 1. Serotyping with species specific monoclonal antibodies. *Acta Tropica*,75: 301-307.
39. Sharifi I, Ardehali S, Motazadian H et al. (1997). Identification and characterization of *Leishmania* isolates in school children in Bam, southeastern Iran. *Iran J Med Sci*, 22: 82–88.
40. Aflatoonian MR, Sharifi I (2010). Prevalence rate of cutaneous leishmaniasis in Bam district during 20 years (1988-2007). *J Kerman Univ Med Sci*, 17 (4): 297-306.
41. Sharifi I, Nakhaei N, Aflatoonian MR et al. (2011). Cutaneous leishmaniasis in Bam: a comparative evaluation of pre- and post-earthquake years (1999–2008). *IranJ Public Health*, 40: 49–56.
42. Aflatoonian MR, Sharifi I, HakimiParizi M et al. (2014). A prospective cohort study of cutaneous leishmaniasis risk and opium addiction in south eastern Iran. *PLoS One*, 9(2): e89043.doi: 10.1371/journal.pone.0089043
43. Sharifi I, Zarezadeh M, Fekri AR (2001). Identification of cutaneous leishmaniasis species by immunofluorescence examination using monoclonal antibodies in Kerman and Rafsanjan cities. *HamdardMedicus*, XLIX: 103-106.
44. Yaghoobi-Ershadi MR, Hakimiparizi M, Zahraei-Ramazani AR et al. (2010). Sandfly surveillance within an emerging epidemic focus of cutaneous leishmaniasis in southeastern Iran. *Iran J Arthropod Borne Dis*, 4:17–23.
45. Sharifi I, Fekri AR, Aflatoonian MR et al. (1998). Cutaneous leishmaniasis in primary school children in the southeastern Iranian city of Bam, 1994–1995. *Bull WHO*, 76: 289–293.
46. Sharifi I, Fekri AR, Aflatoonian MR et al. (2010). Leishmaniasis recidivans among school children in Bam, South-east Iran, 1994– 2006. *Int J Dermatol*, 49: 557–561.