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Epidemiological features, clinical manifestation and laboratory findings of patients with cutaneous leishmaniasis in Genaveh County, Bushehr Province, Southern Iran

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PEER REVIEW

Peer reviewer

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Comments

In general, the paper is well structured; the methods are reproducible and the data are well presented. This is a good research in which the authors explained the demography and epidemiology of this disease in Southern Iran. The findings are interesting and suggested that cutaneous leishmaniasis is endemic and common in this part of Iran.

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ABSTRACT

Objective: To examine the epidemiological features of cutaneous leishmaniasis in Genaveh County, Southern Iran.

Methods: This descriptive study was conducted during 2004-2008. A questionnaire was completed for each case regarding age, gender, place of residence, the number and location of cutaneous leishmaniasis lesions *etc*. Suspected active lesions were scraped with a sterile blade and the samples smeared onto glass slides, fixed with methanol, stained with Giemsa and examined under a light microscope for the presence of amastigotes.

Results: Totally, 135 cases of cutaneous leishmaniasis came to the health centers. The highest number of patients catching cutaneous leishmaniasis was found in 2006 (n=54). Most cases (56.3%) occurred during winter. The most highly infected age group was 1 to 10 years .The hands were the most affected parts of the body. About 54% of the patients had one lesion. The most cases (53.3%) occurred in rural areas.

Concluions: It is important for the health authorities to take powerful actions to control cutaneous leishmaniasis. Meanwhile, It is significant to prepare quick treatment of cases.

KEYWORDS

Cutaneous leishmaniasis, Epidemiology, Prevalence, Iran

1. Introduction

Leishmaniasis has a diversity of clinical signs ranging from deadly visceral to self-curing dermal ulcers. Cutaneous leishmaniasis is the most prevalent type of leishmaniasis. This disease is a parasitic infectious disease. The etiological agents of cutaneous leishmaniasis are different species of the genus *Leishmania*[1]. The cutaneous leishmaniasis is transmitted by the bite of female phlebotomine sand flies. Of about 800 sand fly species in the globe, approximately 50 have been considered as vectors of leishmaniasis[2,3]. In Australia, evidence incriminates midges (Diptera: Ceratopogonidae) as potential vectors of *Leishmania*. Screening determined that a species of day-feeding midge, subgenus *Forcipomyia* (*Lasiohelea*), had an infection rate of up to 15% for *Leishmania* DNA[4].

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Approximately 90% of cutaneous leishmaniasis patients have been reported from Afghanistan, Iran, Iraq, Saudi Arabia, Algeria, Brazil and Peru[5]. Cutaneous leishmaniasis is endemic in around half of 31 provinces of Iran[6]. The incidence of cutaneous leishmaniasis was changed from 0.002 to 1.337 from 2001 to 2011[3]. The prevalence of cutaneous leishmaniasis has been estimated to be 1.8%-37.9% in various provinces of Iran and *Leishmania major* and *Leishmania tropica* are the causative agents of zoonotic cutaneous leishmaniasis and anthroponotic cutaneous leishmaniasis, respectively[1,7].

Numerous epidemiological features of cutaneous leishmaniasis have been researched in different provinces of Iran including Khuzistan, Mazandaran, Ilam, Kashan, Isfahan, Kerman and Sistan-Baluchistan[2,3,8-12]. Affects of this disease on mental sanitation and beauty of the patients make more effective procedures necessary to prevent and control the disease. Bushehr Province, located in the south of Iran, is known to be an endemic region for cutaneous leishmaniasis. Due to the geography of the region and abundance of reservoir hosts (rodents), Genaveh County is one of the endemic regions of the disease in the above mentioned province. This investigation was aimed to study the epidemiology of cutaneous leishmaniasis in the five years (2004-2008) in order to present prevention and educational actions.

2. Materials and methods

This was a descriptive and cross sectional research. To specify the epidemiology of cutaneous leishmaniasis during 2004-2008, Genaveh County was studied. Patients were detected based on their lesion clinical manifestations of cutaneous leishmaniasis. Suspected active lesions were scraped with a sterile blade and the samples smeared on to glass slides, fixed with methanol, stained with Giemsa and examined under a light microscope for the presence of amastigotes.

Information like gender, age, place of residence, the number of lesions, month and season that lesions occur, lesion site on the body were collected using a questionnaire. Subsequently, the results were analyzed using the SPSS version 17.

3. Results

The results of this research revealed that totally 135 patients with the cutaneous leishmaniasis have been detected over 2004-2008. Mean incidence rate was determined as 0.32/1 000 population. Table 1 shows the trend of cases with cutaneous leishmaniasis and incidence rates in the various years within the study period. Of the total cases, 63 and 72 patients were living in cities and villages, respectively (Table 2). The results showed that the most cases have been reported in February (29.6%, n=40), March (14.8%, n=20) and January (11.6%, n=16) (Table 3). The maximum disease prevalence was found in winter, in this study 76 cases had occurred in this season (Table 4).

Table 1
Changes of the cutaneous leishmaniasis cases and incidence rates in Genaveh County, Bushehr Province, Southern Iran (2004-2008).

Years	Frequency (n)	Incidence/1 000 population
2004	7	0.08
2005	11	0.13
2006	54	0.64
2007	26	0.31
2008	37	0.44
Total	135	0.32

Table 2
Frequency distribution of cutaneous leishmaniasis cases by residential places in Genaveh County, Bushehr Province, Southern Iran (2004-2008).

Years	City [n (%)]	Rural [n (%)]	Total [n (%)]
2004	3 (42.9)	4 (57.1)	7 (100)
2005	4 (36.4)	7 (63.6)	11 (100)
2006	20 (37.0)	34 (63.0)	54 (100)
2007	19 (73.0)	7 (27.0)	26 (100)
2008	17 (46.0)	20 (54.0)	37 (100)
Total	63 (46.7)	72 (53.3)	135 (100)

Table 3
Frequency distribution of cutaneous leishmaniasis cases by months in Genaveh County, Bushehr Province, Southern Iran (2004-2008).

Month	2004 [n (%)]	2005 [n (%)]	2006 [n (%)]	2007 [n (%)]	2008 [n (%)]	Total [n (%)]
April	1 (14.3)	1 (9.1)	2 (3.7)	8 (30.7)	2 (5.4)	14 (10.4)
May	1 (14.3)	0 (0.0)	2 (3.7)	1 (3.9)	0 (0.0)	4 (3.0)
June	0 (0.0)	0 (0.0)	2 (3.7)	1 (3.9)	0 (0.0)	3 (2.2)
July	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.9)	0 (0.0)	1 (0.8)
August	0 (0.0)	1 (9.1)	0 (0.0)	1 (3.9)	0 (0.0)	2 (1.5)
September	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.9)	1 (2.7)	2 (1.5)
October	0 (0.0)	0 (0.0)	2 (3.7)	3 (11.5)	7 (18.9)	12 (8.9)
November	1 (14.3)	2 (18.2)	1 (1.8)	4 (15.2)	2 (5.4)	10 (7.5)
December	0 (0.0)	2 (18.2)	2 (3.7)	2 (7.7)	5 (13.5)	11 (8.2)
January	0 (0.0)	1 (9.1)	9 (16.7)	3 (11.5)	3 (8.1)	16 (11.6)
February	0 (0.0)	4 (36.3)	23 (42.6)	1 (3.9)	12 (32.5)	40 (29.6)
March	4 (57.1)	0 (0.0)	11 (20.4)	0 (0.0)	5 (13.5)	20 (14.8)
Total	7 (100.0)	11 (100.0)	54 (100.0)	26 (100.0)	37 (100.0)	135 (100.0)

Table 4
Frequency distribution of cutaneous leishmaniasis cases by seasons in Genaveh County, Bushehr Province, Southern Iran (2004-2008).

Seasons	2004 [n (%)]	2005 [n (%)]	2006 [n (%)]	2007 [n (%)]	2008 [n (%)]	Total [n (%)]
Spring	2 (28.6)	1 (9.1)	6 (11.1)	10 (38.5)	2 (5.4)	21 (15.6)
Summer	0 (0.0)	1 (9.1)	0 (0.0)	3 (11.5)	1 (2.7)	5 (3.7)
Autumn	1 (14.3)	4 (36.4)	5 (9.2)	9 (34.6)	14 (37.9)	33 (24.4)
Winter	4 (57.1)	5 (45.4)	43 (79.7)	4 (15.4)	20 (54.0)	76 (56.3)
Total	7 (100.0)	11 (100.0)	54 (100.0)	26 (100.0)	37 (100.0)	135 (100.0)

Out of 135 positive cases of cutaneous leishmaniasis, 73 patients (54%) were men, while 62 (46%) were women (Table 5). More patients were in age groups of 1-10 (28.2%, n=38), 11-20 (21.5%, n=29), and 21-30 (18.5%, n=25) years old (Table 6). The highest number of lesions was related to hands (39.2%, n=53), feet (32.6%, n=44) and faces (23%, n=31), respectively (Table 7). The most cases (54%, n=73) had one lesion (Table 8). By the detection methods of disease, about 54% of patients were diagnosed according to clinical

manifestations and 46% based on laboratory findings (Table 9).

Table 5

Frequency distribution of cutaneous leishmaniasis cases by sexes in Genaveh County, Bushehr Province, Southern Iran (2004-2008).

Years	Female [*n* (%)]	Male [*n* (%)]	Total [*n* (%)]
2004	5 (71.4)	2 (28.6)	7 (100)
2005	5 (45.5)	6 (54.5)	11 (100)
2006	23 (42.6)	31 (57.4)	54 (100)
2007	13 (50.0)	13 (50.0)	26 (100)
2008	16 (43.2)	21 (56.8)	37 (100)
Total	62 (46.0)	73 (54.0)	135 (100)

Table 6

Frequency distribution of cutaneous leishmaniasis cases by age groups (years) in Genaveh County, Busheher Province, Southern Iran (2004-2008).

Age groups	2004 [*n* (%)]	2005 [*n* (%)]	2006 [*n* (%)]	2007 [*n* (%)]	2008 [*n* (%)]	Total [*n* (%)]
0-10	1 (14.3)	4 (36.4)	24 (44.4)	6 (23.1)	3 (8.1)	38 (28.2)
11-20	4 (57.1)	3 (27.3)	10 (18.5)	7 (27.0)	5 (13.5)	29 (21.5)
21-30	2 (28.6)	0 (0.0)	10 (18.5)	5 (19.3)	8 (21.6)	25 (18.5)
31-40	0 (0.0)	3 (27.3)	3 (5.6)	3 (11.5)	12 (32.4)	21 (15.6)
41-50	0 (0.0)	1 (9.0)	3 (5.6)	3 (11.5)	6 (16.2)	13 (9.6)
51-60	0 (0.0)	0 (0.0)	2 (3.7)	1 (3.8)	1 (2.7)	4 (2.9)
> 60	0 (0.0)	0 (0.0)	2 (3.7)	1 (3.8)	2 (5.5)	5 (3.7)
Total	7 (100.0)	11 (100.0)	54 (100.0)	26 (100.0)	37 (100.0)	135 (100.0)

Table 7

Frequency distribution of cutaneous leishmaniasis cases by lesion sites on the body in Genaveh County, Bushehr Province, Southern Iran (2004-2008).

Lesion sites	2004 [*n* (%)]	2005 [*n* (%)]	2006 [*n* (%)]	2007 [*n* (%)]	2008 [*n* (%)]	Total [*n* (%)]
Hands	3 (42.9)	3 (27.2)	19 (35.1)	10 (38.5)	18 (48.7)	53 (39.2)
Feet	2 (28.5)	4 (36.4)	18 (33.3)	10 (38.5)	10 (27.0)	44 (32.6)
Faces	1 (14.3)	4 (36.4)	14 (26.0)	6 (23.0)	6 (16.2)	31 (23.0)
Trunks	1 (14.3)	0 (0.0)	3 (5.6)	0 (0.0)	3 (8.1)	7 (5.2)
Total	7 (100.0)	11 (100.0)	54 (100.0)	26 (100.0)	37 (100.0)	135 (100.0)

Table 8

Frequency distribution of cutaneous leishmaniasis cases by number of lesions on the body in Genaveh County, Bushehr Province, Southern Iran (2004-2008).

Lesions (*n*)	2004 [*n* (%)]	2005 [*n* (%)]	2006 [*n* (%)]	2007 [*n* (%)]	2008 [*n* (%)]	Total [*n* (%)]
1	5 (71.4)	7 (63.6)	30 (55.6)	17 (65.5)	14 (37.9)	73 (54.0)
2	2 (28.6)	2 (18.2)	12 (22.2)	3 (11.5)	10 (27.0)	29 (21.6)
3	0 (0.0)	2 (18.2)	6 (11.1)	3 (11.5)	3 (8.1)	14 (10.4)
4	0 (0.0)	0 (0.0)	6 (11.1)	3 (11.5)	10 (27.0)	19 (14.0)
Total	7 (100.0)	11 (100.0)	54 (100.0)	26 (100.0)	37 (100.0)	135 (100.0)

Table 9

Frequency distribution of cutaneous leishmaniasis cases by detection methods in Genaveh County, Bushehr Province, Southern Iran (2004-2008).

Years	Laboratory [*n* (%)]	Clinical [*n* (%)]	Total [*n* (%)]
2004	6 (85.7)	1 (14.3)	7 (100)
2005	8 (72.7)	3 (27.3)	11 (100)
2006	27 (50.0)	27 (50.0)	54 (100)
2007	11 (42.3)	15 (57.7)	26 (100)
2008	10 (27.0)	27 (73.0)	37 (100)
Total	62 (46.0)	73 (54.0)	135 (100)

4. Discussion

Abundance and distribution of reservoir hosts and vectors of cutaneous leishmaniasis is affected by various environmental agents. Human interventions (such as urbanization, deforestation and construction of dams) and climatic agents (such as rainfall and temperature) and flora are the most known environmental factors on this disease occurrence[6,13].

The present study confirmed that cutaneous leishmaniasis prevalence has increased in Genaveh County during 2004-2008. Totally, about 135 cases have been found in this region during the research period; approximately 40% and 27.4% of cases happened in 2006 and 2008, respectively. Genaveh County is considered as one of the endemic regions of cutaneous leishmaniasis in Iran. In this study, most cases were found in male. This result is consistent with the results of studies conducted by Karami in the city of Isfahan[14]. In the mentioned study during 2007-2008, out of 1 315 people with cutaneous leishmaniasis infection, 61.8% were men, and 38.2% were women[14]. Among patients suspected of cutaneous leishmaniasis referred to the Department of Parasitology, the Pasteur Institute of Iran during 2006-2009, skin lesions were more common among men (63.8%) than women (36.2%)[15]. Similarly, in an investigation in 2008 in Qom and Shiraz (two counties in Iran), 59.3% of the people with cutaneous leishmaniasis were males[16]. Former studies showed the same results indicating that men are more generally infected than women, possibly due to their contact, most likely as a result of job exposure, with the outdoor phlebotomine sand fly vectors.

According to the results of our study, the highest number of patients was found in the age group of 1-10 years old. In other studies, percentage of the cutaneous leishmaniasis in the different age groups has been surveyed. In study of Karami *et al*., the cutaneous leishmaniasis was detected to infect entire the age categories, however, the most frequency (32.1%) of cases with cutaneous leishmaniasis was found in 21-30 years old people[14]. In study of Maraghi *et al*. in Shush City (Southwestern Iran), the most infected age group was under 10 years with a rate of 42%[10]. In research of Kassiri *et al*. in Shushtar County (Southwestern Iran), the highest incidence rate of the disease was detected among age groups of 20-29 years old (43.2%) and 10-19 years old (18%)[11]. Altogether, by considering the results of different investigations, we can conclude that situation of the cutaneous leishmaniasis in various age groups depend on the intensity of the illness endemicity. In other words, it can be concluded that infection rates in various age groups depend upon the study area. In locations with plenty vectors and reservoir hosts (like Isfahan, Central Iran), large population and people's numerous contacts with reservoirs and vectors, age group of 5-6 years old are the highly infected category. Accordingly, it is very rare in adults, as about 90% of the patients increase life-time immunity against the illness.

But, in other parts of Iran with most population changes, the disease can be observed in all age categories[14].

To have information about the geographical location of infection is significant in order to focus on epidemiological type of disease. Most cases in the present study resided in the rural regions. In studies in Kashan and Shushtar[11,17], most patients with cutaneous leishmaniasis were residents of rural areas that is in agreement with our study. According to the number of lesions in the patients, clinical examination displayed that the single lesion was the most common in patients (54%); 24.4% of patients had several lesions and double lesions were seen in 21.6% of cutaneous leishmaniasis cases. A report by Talari *et al*. showed that 69.7% of patients had just one lesion[18]. Farahmand *et al*. reported that number of lesions observed in patients varied; single lesion (58%), double lesions (22%), and multiple lesions (20%) on their bodies were found[15]. Karami *et al*. observed that the most of cases with cutaneous leishmaniasis (54%) had more than one lesion[14]. Multiple lesions can result from inoculation following scraping or receiving infected bites of sand flies at various periods.

The different lesion sites on the body can be due to to many factors, such as climate, the sand fly species, culture and habits of social communities. According to our findings, 39.2% of cases had lesions on hands, 32.6% on feet, 23% on faces and 7% on other parts of the body. Farahmand *et al*. reported that hands were the most commonly affected sites of lesions (40%), followed by faces (37.5%), feet (20%) and trunks (2.5%)[15]. This report confirms our finding. Also, other investigations in different parts of Iran have indicated that the majority of lesions happened in hands, face, neck and head[14,19]. Because of sand fly bite to the exposed body areas, the majority of the lesions appear in the feet, hands and face, which may be due to outside sleeping without applying bed net during the hot months.

In the present study, the highest incidence of the disease was in winter (56.3%), followed by fall (24.4%), spring (15.6%) and summer (3.7%), respectively. This difference is explained by the disease cycle. The transmission of the infection from reservoir hosts (rodents) to individuals occurs at the end of the vector seasonal activity and after an incubation period (mostly one week to two months), the lesions emerge in persons. In contrast to our findings, a study in Iranian military personnel reported most cases of the disease in autumn (69%)[5]. Furthermore, in a study in Isfahan, Iran, 2007-2008, the most lesions occurred during fall (52.6%), summer (22.1%), winter (15.1%) and spring (10.6%), respectively[14]. In agreement with our findings, a study in Pakistan reported most cases of the disease in winter[20]. Principally, cutaneous leishmaniasis in humans follows a seasonal pattern in areas where adult sand flies' development is seasonal. Infections were found to depend on abundance of the vector sand flies, type of cutaneous leishmaniasis and prevalence of reservoir hosts.

Based on the results of this study, Genaveh County is an important region with partly great cutaneous leishmaniasis infection rate. Although the number of found cases of cutaneous leishmaniasis in this study was 135 in five years, the real number may be much greater. Therefore, a more comprehensive and careful investigation is recommended.

Conflict of interest statement

We declare that we have no conflict of interest.

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Comments

Background

Leishmaniasis is one of the most significant public health problem in the globe. The disease is endemic in more than 98 countries including Iran. Annually about 0.7-1.2 million people around the world contract leishmaniasis. Each year, about 20 000 new cases of leishmaniasis are reported in Iran, but, real cases are 4-5 folds. Cutaneous leishmaniasis is an old endemic disease in Iran. It is observed in two types, including: anthroponotic cutaneous leishmaniasis and zoonotic cutaneous leishmaniasis. The causative agent of anthroponotic cutaneous leishmaniasis is *Leishmania tropica* and the proven vector is *Phlebotomus sergenti*. The causative agent of zoonotic cutaneous leishmaniasis is *Leishmania major* and *Phlebotomus papatasi* is the only proven vector of the disease to human.

Research frontiers

The aim of this study was to explain the demographic and epidemiologic profile in cases with cutaneous leishmaniasis in Genaveh County, Southern Iran. Continuous surveillance and reporting are necessary to monitor this disease and the efficacy of control programs.

Related reports

It was reported that most cases occurred in the winter (56.3%) and autumn (24.4%). Tabibian *et al*. (2014) reported the most patients in the autumn (69%). According to a research in Pakistan, the maximum cases of the disease were found in winter (Mujtaba and Khalid, 1998). Nearly 53.3% of the patients were residents of villages. This is in consistent with the studies of Iran (Doroodgar *et al*, 2009; Kassiri *et al*,

2014). It has been found that majority of the cases were men (54%). This result is in accordance with the results of other studies in Iran (Karami *et al.*, 2013; Farahmand *et al.*, 2011; Rafati *et al.*, 2004). The present research found that the most highly infected age group was 1 to 10 years old, which is in agreement with a study in Shush City, Southwestern Iran (Maraghi *et al.*, 2007).

Innovations and breakthroughs

This research showed that the cutaneous leishmaniasis is endemic and prevalent in Genaveh County. The most cases were observed in rural areas, in men and people under 10 years old. These findings is highly important in the field of epidemiology to combat the disease.

Applications

It is important to monitor the presence of cutaneous leishmaniasis in each region and to know the epidemiology and distribution of this disease in the endemic areas. The results of the present study are useful for prevention of cutaneous leishmaniasis.

Peer review

In general, the paper is well structured; the methods are reproducible and the data are well presented. This is a good research in which the authors explained the demography and epidemiology of this disease in Southern Iran. The findings are interesting and suggested that cutaneous leishmaniasis is endemic and common in this part of Iran.

References

[1] Saki J, Khademvatan S. A molecular study on cutaneous leishmaniasis lesions in Khuzestan Province (south west of Iran). *JundishapurJ Microbiol* 2011; **4**(4): 283-288.

[2] Dehghani R, Kassiri H, Mehrzad N, Ghasemi N. The prevalence, laboratory confirmation, clinical features and public health significance of cutaneous leishmaniasis in Badrood City, an old focus of Isfahan Province, Central Iran. *J Coast Life Med* 2014; **2**(4): 319-323.

[3] Karimi A, Hanafi-Bojd AA, Yaghoobi-Ershadi MR, Akhavan AA, Ghezelbash Z. Spatial and temporal distributions of phlebotomine sand flies (Diptera: Psychodidae), vectors of leishmaniasis, in Iran. *Acta Trop* 2014; **132**: 131-139.

[4] Dougall AM, Alexander B, Holt DC, Harris T, Sultan AH, Bates PA, et al. Evidence incriminating midges (Diptera: Ceratopogonidae) as potential vectors of *Leishmania* in Australia. *Int J Parasitol* 2011; **41**: 571-579.

[5] Tabibian E, Shokouh SJH, Dehgolan SR, Moghaddam AD, Tootoonchian M, Noorifard M. Recent epidemiological profile of cutaneous leishmaniasis in Iranian military personnel. *J Arch Mil Med* 2014; doi: 10.5812/jamm.14473.

[6] Mollalo A, Alimohammadi A, Shahrisvand M, Shirzadi MR, Malek MR. Spatial and statistical analyses of the relations between vegetation cover and incidence of cutaneous leishmaniasis in an endemic province, northeast of Iran. *Asian Pac J Trop Dis* 2014; **4**(3): 176-180.

[7] Ghasemian M, Maraghi S, Samarbafzadeh AR, Jelowdar A, Kalantari M. The PCR-based detection and identification of the parasites causing human cutaneous leishmaniasis in the Iranian city of Ahvaz. *Ann Trop Med Parasitol* 2011; **105**(3): 209-215.

[8] Kassiri H, Sharifinia N, Jalilian M, Shemshad K. Epidemiological aspects of cutaneous leishmaniasis in Ilam Province, west of Iran (2000-2007). *Asian Pac J Trop Dis* 2012; **2**: S382-S386.

[9] Kassiri H, Naddaf SR, Javadian EA, Mohebali M. First report on isolation and characterization of *Leishmania major* from *Meriones hurrianae* (Rodentia: Gerbillidae) of a rural cutaneous leishmaniasis focus in South-Eastern Iran. *Iran Red Crescent Med J* 2013; **15**(9): 789-793.

[10] Maraghi S, Zadeh AS, Sarlak AA, Ghasemian M, Vazirianzadeh B. Identification of cutaneous leishmaniasis agents by nested polymerase chain reaction (nested-PCR) in Shush City, Khuzestan Province, Iran. *Iran J Parasitol* 2007; **2**(3): 13-15.

[11] 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; doi: 10.1016/S2221-6189(14)60024-X.

[12] Kassiri H, Shemshad K, Shojaee S. The incidence rate of cutaneous leishmaniasis in Behbahan County of Khuzestan Province, Southwest of Iran. *Jundishapur J Microbiol* 2013; doi: 10.5812/jjm.7045.

[13] Ready PD. Leishmaniasis emergence and climate change. *Rev Sci Tech* 2008; **27**(2): 399-412.

[14] Karami M, Doudi M, Setorki M. Assessing epidemiology of cutaneous leishmaniasis in Isfahan, Iran. *J Vector Borne Dis* 2013; **50**: 30-37.

[15] Farahmand M, Nahrevanian H, Shirazi HA, Naeimi S, Farzanehnejad Z. An overview of a diagnostic and epidemiologic reappraisal of cutaneous leishmaniasis in Iran. *Braz J Infect Dis* 2011; **15**(1): 17-21.

[16] Rafati N, Shapori-Moghadam A, Ghorbani R. [Epidemiological survey of cutaneous leishmaniasis in Damghan (1999-2005)]. *J Semnan Univ Med Sci* 2004; **1**: 247-253. Persian.

[17] Doroodgar A, Mahboubi S, Nematyan M, Sayyah M, Doroodgar M. [Epidemiology of cutaneous leishmaniasis in Kashan Provice in 2007]. *J Semnan Univ Med Sci* 2009; **10**(3): 177-184. Persian.

[18] Talari SA, Talaei R, Shajari G, Vakili Z, Taghaviardakani A. Childhood cutaneous leishmaniasis: report of 117 cases from Iran. *Korean J Parasitol* 2006; **44**(4): 355-360.

[19] Zahir nia AH, Moradi AR, Nourozi NA, Bathaie SJN, Erfani H, Moradi A. [Epidemiology of cutaneous leishmaniasis in the province during the years 2002 to 2007]. *J Hamadan Univ Med Sci* 2009; **51**: 43-47. Persian.

[20] Mujtaba G, Khalid M. Cutaneous leishmaniasis in Multan. *Int J Dermatol* 1998; **37**: 843-845.