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Research Article

**THE PREVALENCE OF CUTANEOUS LEISHMANIASIS IN
EAST OF AHVAZ COUNTY, SOUTH-WESTERN IRAN**Hamid Kassiri ^{1*}, Atefe Ebrahimi ², Masoud Lotfi ³¹ School of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.² Student Research Committee, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.³ Abdanan Health Center, Ilam University of Medical Sciences, Ilam, Iran. School of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.**Abstract:**

Objectives: Cutaneous Leishmaniasis (CL) is a zoonotic parasitological disease. This disease cause always important health challenges for the human communities. It is common in many parts of the globe. This research was designed to determine the epidemiology of CL in East of Ahvaz County during 2003- 2013.

Methods: This was a descriptive cross-sectional study. The disease was diagnosed based on clinical examination and microscopic observation of the parasite in the ulcer site. The patient's

Information such as age, gender, number and sites of ulcer (s) on the body, month and residence area were recorded. Data analysis was performed using SPSS software.

Results: Totally, 2287 cases were detected during 2003 – 2013. About 53.4% patients were male and 46.4% female. The highest frequency infected age groups were observed in 10-19 years old (n=550, 24%). Nearly 37 % of the patients had one and 38.1% had three ulcers. The most common location of ulcers were on hands (n=1022, 44.7%) and then on feet (n=501, 21.9%). Totally 1877 of the patients were infected in rural areas. Based on the appearance of the lesion it was found that 410 cases (17.9%) were of the dry type and 1877 cases (82.1%) were wet type.

Concluiaons: Such high prevalence and incidence rates are alarming and require control and prevention measures. Further epidemiological studies of CL are suggested.

Key words: Epidemiology, Cutaneous Leishmaniasis, Iran.

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INTRODUCTION:

According to the World Health Organization, leishmaniasis is one of the nine most important infectious diseases worldwide [1]. Socioeconomic development and environmental changes have increased the risk factors of this disease around the world. Leishmaniasis is transmitted through the bite of an infected female sand fly. More than 20 *Leishmania* species are responsible for diseases in humans [2]. Leishmaniasis annually affects 1.5-2.5 million people [3]. Cutaneous Leishmaniasis (CL) is the most common form of the disease, and 90% of cases are related to eight countries of Afghanistan, Algeria, Brazil, Saudi Arabia, Syria, Iraq, and Iran [4].

Cutaneous leishmaniasis occurs in two epidemiological forms in Iran. The dry type (anthroponotic or urban CL) have been reported from Kerman, Bam, Mashhad, Nishapur, and Sabzevar. The reservoir and vector of urban CL are human and *Phlebotomus sergenti*, respectively [5, 6]. Recently, new foci of the disease have been found in Rafsanjan and Khomeyni Shahr [7, 8]. The wet type (zoonotic or rural CL) has been observed in Isfahan, Sarakhs, Lotfabad, Kashmar, Khuzestan, Ilam and Baft. The reservoirs of the wet type are rodents and its vector is *Phlebotomus papatasi* [9, 10]. Recently, new foci of this disease have been found in Shiraz and villages around Kashan [11, 12]. Many reports indicate that this disease is increasingly expanding in Iran and around the world, causing the waste of manpower and cost [3,13].

Although leishmaniasis control has always been considered in national plans and programs of Iran, and extensive efforts and national and international investments have been made in this issue, not only this disease has not been eradicated but also new foci of it have been recently diagnosed around Iran [14]. Leishmaniasis National Control Program emphasizes the need for determine the epidemiological characteristics of the leishmaniasis in the disease foci. In addition, in order to choose the right method to combat disease and increase the success of control programs, it is necessary to determine epidemiological characteristics of diseases in their foci. Over the past few years, several studies have been conducted on the epidemiology of CL in

different regions of Iran. Given the proximity of Khuzestan Province with endemic foci of CL such as Bushehr, Ilam, and Isfahan Provinces and the emergence of new foci of CL in this province including Ahvaz County, the present study aims to evaluate the epidemiological aspects of this disease and further highlight the importance of controlling it in the east of Ahvaz .

MATERIALS AND METHODS:

The present research was a descriptive cross – sectional study which was conducted based on information of patients with CL visited health centers in the east of Ahvaz from April 2003 to March 2013. After necessary examinations and confirmation of the disease (finding Leishman-Donovan body in the smears of the sore of the patients), their information was registered in special forms and then they had received proper treatments. The collected information included age, gender, and nationality, place of residence, type and number of lesions which was statistically analyzed in SPSS.

RESULTS:

During the period 2003-2013, information of 2287 patients with CL visited health centers of the east Ahvaz was registered in health centers in the east of Ahvaz .The incidence of this disease followed a downward trend in this 11-year period, as it reduced from 856 registered cases in 2003 to only 61 cases in 2013 (Figure 1). In terms of gender, 53.4% of patients were male and 46.6% of them were female (Table 1). The highest incidence (n=550, 24%) was observed in the age group 10-19. Almost three-quarters of patients aged under the age of thirty. Table 2 and Figure 2 shows the frequency distribution of leishmaniasis in different age groups. In terms of lesion site on the body, the highest frequency was related to hands with 1022 cases (44.7%), legs with 501 cases (21.9%), and face with 369 cases (16.1%) (Table 3 and Figure 3). Study the number of lesions on the body also showed that 651 (38.1%), 645 (37.0%) and 537 (24.9%) of patients had three, one, and two lesions, respectively (Table 4). Molecular survey of *Leishmania* parasite was not conducted, but based on the appearance of the lesion it was found that 410 cases (17.9%) were of the dry type and 1877 cases (82.1%) were wet type (Table 5).

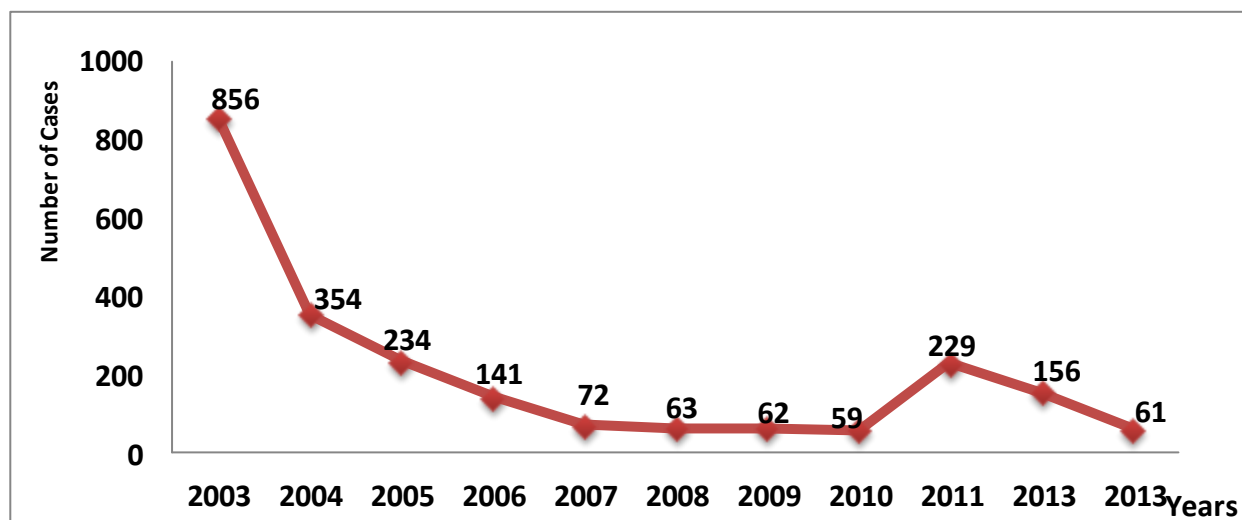


Fig1: Trend of cutaneous leishmaniasis cases, east of Ahvaz County, Southwestern Iran (2003-2013).

Table 1: Distribution of cutaneous leishmaniasis cases according to the gender, East of Ahvaz County, Southwestern Iran (2003-2013).

Gender Years	Male No. (%)	Female No. (%)	Total No. (%)
2003	415(48.5)	441(51.5)	856(100)
2004	188(53.1)	166(46.9)	354(100)
2005	137 (58.5)	97(41.5)	234(100)
2006	71(50.3)	70(49.7)	141(100)
2007	47 (65.3)	25(34.7)	72(100)
2008	48 (77.4)	14(22.6)	62 (100)
2009	44 (69.8)	19(30.2)	63 (100)
2010	34 (57.6)	25(42.4)	59(100)
2011	118 (51.5)	111 (48.5)	229 (100)
2012	85 (54.5)	71 (45.5)	156 (100)
2013	33 (54.0)	28 (46.0)	61 (100)
Total	1220 (53.4)	1067(46.6)	2287 (100)

Table 2: Frequency distribution of cutaneous leishmaniasis cases by the age groups (years) in East of Ahwaz County (2003-2013).

Age groups Years	<5 No. (%)	5-10 No. (%)	10-19 No. (%)	20-29 No. (%)	30-39 No. (%)	40-49 No (%)	>50 No (%)	Total No. (%)
2003	79 (9.2)	144(16.8)	244(28.5)	156(18.2)	105(12.3)	68(8.0)	60(7.0)	856(100)
2004	46 (13.0)	49 (13.8)	98 (27.6)	66 (18.6)	33 (9.4)	31 (8.8)	31 (8.8)	354 (100)
2005	37(15.8)	24 (10.2)	60 (25.6)	44 (18.8)	33 (14.1)	17 (7.3)	19 (8.2)	234 (100)
2006	14 (9.9)	17(12.0)	35 (24.8)	34 (24.1)	11(7.8)	18 (12.9)	12 (8.5)	141 (100)
2007	8 (11.1)	7 (9.7)	13 (18.0)	22(30.5)	14 (19.5)	4 (5.6)	4 (5.6)	72 (100)
2008	7 (11.4)	4 (9.4)	13 (20.4)	27 (43.6)	2 (3.3)	3 (4.9)	6 (9.9)	62(100)
2009	5(7.9)	6(9.5)	10 (15.9)	22 (35.0)	7 (11.1)	8 (12.6)	5(8.0)	63 (100)
2010	7(11.7)	6 (10.2)	9(15.3)	20(34.0)	10(17.0)	4(6.8)	3(5.0)	59(100)
2011	26(11.4)	28(12.2)	28(12.2)	59(25.8)	42(18.4)	22(9.5)	24(10.5)	229(100)
2012	18(11.5)	16(10.3)	28(17.9)	31 (19.9)	26(16.6)	18(11.5)	19(12.3)	156(100)
2013	6(9.8)	6(9.8)	12(19.7)	13(21.3)	13(21.3)	3(4.9)	8(13.2)	61(100)
Total	253 (11.1)	307 (13.5)	550 (24.0)	494 (21.6)	296(13.0)	196 (8.5)	191 (8.3)	2287 (100)

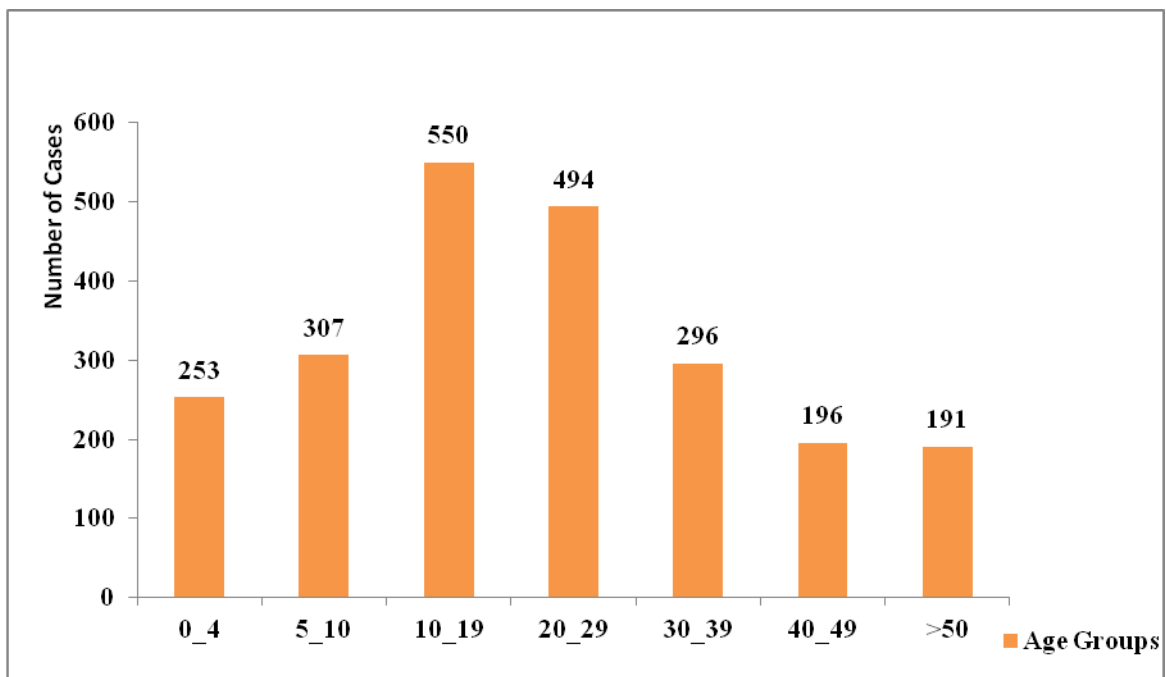


Figure 2: Frequency distribution of cutaneous leishmaniasis cases by the age groups in East of Ahwaz County (2003-2013).

Table 3: Frequency distribution of cutaneous leishmaniasis cases by the ulcer sites on the body in East of Ahwaz County (2003-2013).

Ulcer Sites Years	Feet No. (%)	Hands No. (%)	Faces No. (%)	Hands and Feet No. (%)	Faces and Feet No. (%)	Faces and Hands No. (%)	Others No. (%)	Total No. (%)
2004	104(29.4)	155 (43.8)	58 (16.4)	11 (3.1)	10(2.8)	10 (2.8)	6 (1.7)	354 (100)
2005	63(26.9)	97 (41.4)	47 (20.1)	10 (4.3)	7 (3.0)	7 (3.0)	3 (1.3)	234 (100)
2006	29(20.6)	60(42.6)	13 (9.2)	11 (7.8)	13 (9.2)	12 (8.5)	3 (2.1)	141 (100)
2007	12 (16.7)	26 (36.1)	10 (13.9)	6 (8.3)	7 (9.7)	7(9.7)	4 (5.6)	72 (100)
2008	14 (22.6)	22 (35.5)	8 (12.9)	5 (8.1)	5 (8.1)	6 (9.6)	2 (3.2)	62(100)
2009	16(25.4)	24(38.1)	6 (9.5)	4 (6.4)	6 (9.5)	5 (7.9)	2 (3.2)	63 (100)
2010	9(15.3)	25 (42.2)	5 (8.5)	7(11.9)	6 (10.2)	6 (10.2)	1 (1.7)	59(100)
2011	47(20.5)	93 (40.6)	28(12.2)	20 (8.7)	21(9.2)	18 (7.9)	1 (0.9)	229(100)
2012	26(16.7)	67 (42.9)	18(11.5)	11 (7.1)	10 (6.4)	11 (7.1)	13 (8.3)	156(100)
2013	8(13.1)	19 (31.1)	9(14.8)	7 (11.5)	7 (11.5)	8 (13.1)	3 (4.9)	61(100)
Total	501 (21.9)	1022 (44.7)	369 (16.1)	115 (5.0)	112 (4.9)	112 (4.9)	56 (2.5)	2287 (100)

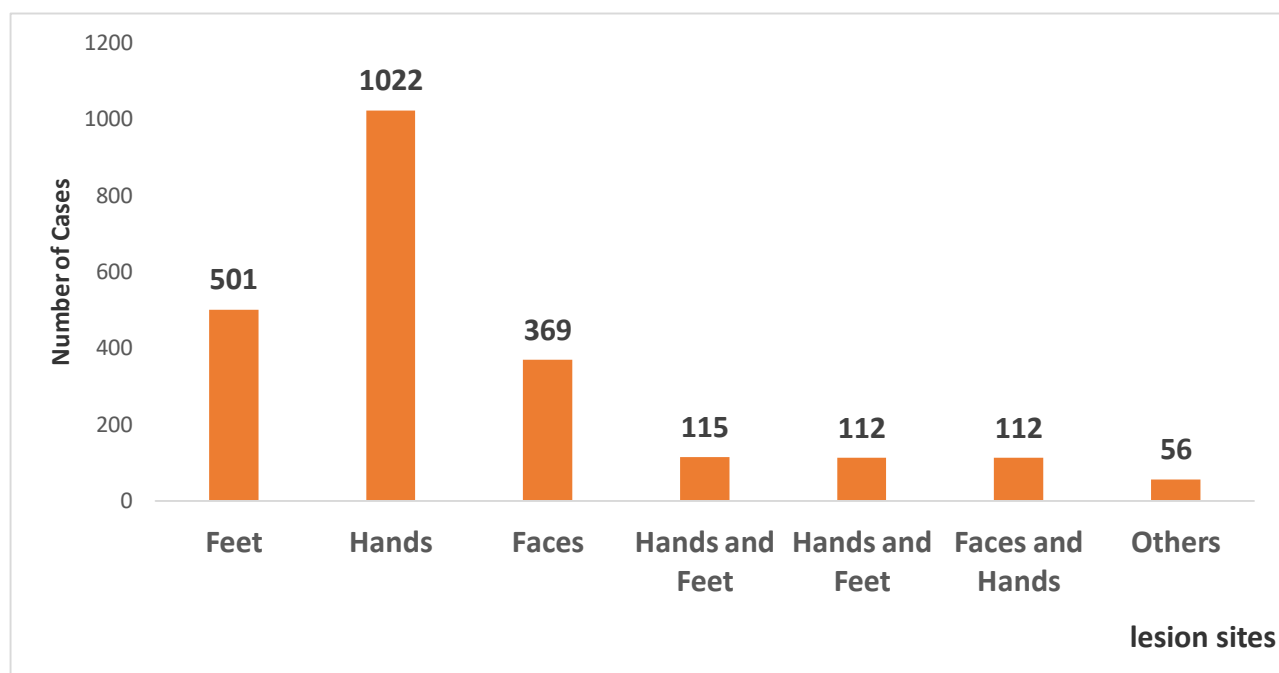


Figure 3: Frequency distribution of cutaneous leishmaniasis cases by the ulcer sites on the body in East of Ahwaz County (2003-2013).

Table 4: Frequency distribution of cutaneous leishmaniasis cases by the number of ulcers on the body in East of Ahwaz County (2003-2013).

Ulcers Years	1 No (%)	2 No (%)	3 No (%)	Total
2003	275 (32.1)	236 (27.6)	345 (40.3)	856 (100)
2004	161 (45.5)	84 (23.7)	109 (30.8)	354 (100)
2005	98 (41.9)	50 (21.4)	86 (36.7)	234 (100)
2006	52 (36.9)	21 (14.9)	68 (48.2)	141 (100)
2007	26 (36.1)	22 (30.5)	24 (33.4)	72 (100)
2008	33 (53.3)	10 (16.1)	19 (30.6)	62 (100)
2009	24(38.1)	15(23.8)	24(38.1)	63(100)
2010	20(33.8)	13(22.1)	26(44.1)	59(100)
2011	93(40.6)	42(18.3)	94(41.1)	229(100)
2012	74(47.6)	34(21.8)	48(30.8)	156(100)
2013	26(42.6)	10(16.4)	25(41.0)	61(100)
Total	645 (37.0)	537 (24.9)	651(38.1)	2287(100)

Table 5: Frequency distribution of cutaneous leishmaniasis cases by the ulcer type in East of Ahwaz County (2003-2013).

Ulcer Years	Dry No. (%)	Wet No. (%)	Total No. (%)
2003	50(5.8)	806(94.2)	856(100)
2004	41(11.6)	313(88.4)	354(100)
2005	36 (15.4)	198(84.6)	234(100)
2006	23(16.3)	118(83.7)	141(100)
2007	32 (44.4)	40(55.6)	72(100)
2008	6 (9.7)	56(90.3)	62(100)
2009	15(23.8)	48(76.2)	63(100)
2010	23(39.0)	36(61.0)	59(100)
2011	94(41.0)	135(59.0)	229(100)
2012	63(40.0)	93(60.0)	156(100)
2013	27(44.0)	34(56.0)	61(100)
Total	410(17.9)	1877(82.1)	2287(100)

Based on statistical analysis of the last five years (2009-2013), the highest and the lowest incidence of disease are related to February (n=129, 22.8%) and July (n=12, 2.1%), respectively (Table 6). In addition, of the total of 568 cases (in the last five years of study), there were 85 (15%), 41 (7.2%), 112

(19.7%), and 330 cases(58.1%) in spring, summer, fall, and winter, respectively (Tables 6 and 7). The data 2009-2013 also revealed that 1877 patients were villagers and 410 patients were living in urban areas during 2009-2013 (Table 8).

Table 6: Frequency distribution of cutaneous leishmaniasis cases by the month in East of Ahwaz County (2009-2013).

Year Month	2009 No. (%)	2010 No. (%)	2011 No. (%)	2012 No. (%)	2013 No. (%)	Total No. (%)
April	5 (7.9)	4(6.7)	2 (1.0)	32 (20.5)	3 (4.9)	46 (8.0)
May	7 (11.1)	4 (6.7)	1 (0.4)	16 (10.1)	1 (1.6)	29 (5.1)
June	0(0.0)	0(0.0)	3(1.3)	7 (4.5)	0(0.0)	10(1.8)
July	3 (4.8)	1 (1.7)	1 (0.4)	6(3.8)	1 (1.6)	12 (2.1)
August	4 (6.3)	2 (3.3)	3 (1.3)	6(3.8)	1 (1.0)	16(2.8)
September	2(3.2)	2 (3.3)	1(0.4)	7(4.9)	1 (1.6)	13(2.3)
October	6(9.5)	3 (5.1)	9(4.0)	10(6.4)	3 (4.9)	31 (5.4)
November	2(3.2)	5 (8.5)	10(4.4)	10(6.4)	2 (3.4)	29(5.1)
December	7 (11.1)	9 (15.4)	22(9.6)	10 (6.4)	4(6.5)	52 (9.2)
January	10 (15.9)	8 (13.5)	47(20.5)	25(16.0)	15 (24.5)	105(18.5)
February	4 (6.4)	12(20.4)	75 (32.7)	15(9.5)	23 (37.8)	129 (22.8)
March	13(20.6)	9 (15.4)	55(24.0)	12(7.7)	7 (11.6)	96(16.9)
Total	63 (100)	59(100)	229 (100)	156(100)	61(100)	568 (100)

Table 7: Frequency distribution of cutaneous leishmaniasis cases by the season in East of Ahwaz County

Year Seasons	2009 No. (%)	2010 No. (%)	2011 No. (%)	2012 No. (%)	2013 No. (%)	Total No. (%)
Spring	12 (19.0)	8 (13.6)	6 (2.6)	55 (35.2)	4(6.5)	85(15.0)
Summer	9 (14.3)	5 (7.9)	5 (2.2)	19 (12.2)	3 (4.9)	41(7.2)
Autumn	15(23.8)	17(27.0)	41 (17.9)	30 (19.2)	9 (14.8)	112(19.7)
Winter	27(42.9)	29(46.0)	177 (77.3)	52(33.4)	45 (73.8)	330 (58.1)
Total	63 (100)	59 (100)	229 (100)	156 (100)	61(100)	568 (100)

Table 8: Frequency distribution of cutaneous leishmaniasis cases by the residential area in East of Ahwaz County (2009-2013).

Residential Area Years	Urban No. (%)	Rural No. (%)	Total No. (%)
2009	54(85.7)	9(14.3)	63 (100)
2010	55 (93.3))	4(6.7)	59(100)
2011	194(84.7)	35 (15.3)	229 (100)
2012	13 (84.0)	25 (16.0)	156 (100)
2013	57 (93.5)	4 (6.5)	61 (100)
Total	491 (86.4)	77(13.6)	568 (100)

DISCUSSION:

Cutaneous leishmaniasis is one of the major global health problems, especially in tropical and subtropical countries, whose scope has exceeded 88 countries in recent years. More than 12 million people worldwide are infected with CL and at least 350 million people are at risk. Field studies show that implementation of control programs in this regions, including reservoir control, vector control and the use of personal protective tools have dramatically reduced the prevalence of CL in recent years. However, the general view of this disease implies an upward trend in Iran [15, 16].

Given the increasing number of susceptible population groups and the suitable ecological situation in Ahvaz, there is a possibility of a sudden increase in CL cases in the future years if controlling programs are discontinued. The growing trend of CL in Iran, which has caused it turn into a major health problem in many provinces, is indicative of the importance of this disease and necessitates epidemiological monitoring for accurate diagnosis of regions infected with CL and controlling its fluctuations. These fluctuations have been extreme in some areas such as Bushehr Province where two major epidemics of CL have been reported in 1988 and 1997, with an incidence of 5.25 and 6.75 per thousand of the population, respectively [16]. The present study was conducted based on passive screening. If active screening for LC is done in Ahvaz, a higher incidence may be determined for this city.

Culture, behavior, occupation and type of clothing of different Iranian ethnicities have caused males be more vulnerable to CL than females. Studies conducted by Hamzavi in Kermanshah [17], Ebadi in Isfahan [18], Feiz - Haddad in Shadegan (68% males and 32% females) [19], Kassiri in Shush (51.2% males and 48.8% females) [20], Kassiri in Bandar Genaveh (54% males and 46% females) [21] and Doroodgar in Kashan [15] showed that the prevalence of this disease is higher in men than women. The results of the present research are consistent with those of these studies, as 53.4% of patients were male and 46.4% of them were female. Fazaeli *et al.* conducted a study on 3100 residents of Mirjaveh County and four villages around it in Sistan - Baluchestan Province in the period 2007-2008 and concluded that there is no significant difference between males and females in terms of incidence rate [22]. However, in studies carried out by Talary in Kashan [23], Ebadi in Isfahan [18], Karimi- Zarchi in Sarakhs [24] and Doroodgar in Kashan [15], the infection rate was higher in women. This has been

attributed to women's economic activities and carpet weaving in dim rooms and basements. In such places, sand flies are also active during the day and continue blood-feeding [25]. Higher incidence of CL in men than women in the present study and some other similar studies may be due to employment of majority of men as seasonal migrant labor, working outdoors, wearing fewer clothes than women, more commute in abandoned and desert areas and higher possibility of contact with sand flies in the evening and at night [26].

In the present study, the highest incidence rate (n=550, 24%) was related to the age group 10-19 years. Doroodgar *et al.* (2007) reported that the highest and the lowest incidence rates of CL in Kashan belonged to the age groups 20-29 years (23.3%) and 0-9 years (7.8%), respectively [15]. Fazaeli *et al.* observed the highest frequency of lesions and scars in the age group under 10, which was significantly different from other age groups [22]. Sharifi *et al.* (2003) conducted a study after the Bam earthquake (in the southeast of Iran) and found that the highest incidence of CL was related to the age group under 10 [27]. In a study conducted in Gonbad Kavous County in 2009-2010, Sufizadeh *et al.* found that the highest incidence of CL belongs to the age group under 10 [28].

In this study, the highest frequency of lesions site on the body was related to hands (44.7%) and then legs (21.9%). In addition, in terms of the number of active lesions on the body, 37%, 24.9%, and 38.1% of patients had one, two, and three lesions, respectively. In a study conducted in Kermanshah Province, most lesions were observed on the face and neck (28%), legs (22%) and other parts of the body (1%). In addition, the number of active lesions on the body of patients ranged between 1 and 23, with a mean of 2.24 for each patient. In total, 54.4%, 19.2% and 9.6% of patients had one, two and three lesions, respectively, and the rest had four or more lesions on their body [17]. In a study by Sharifi *et al.*, lesions were observed on the face of 47% of patients and 77.9% of them had only one lesion [27]. In another study conducted by Sufizadeh *et al.*, it was reported that most lesions (42.3%) were on hands of patients and 37.9% of patients had only one lesion on their body [28]. In a study in Pakdasht, Tehran Province, most lesions of CL were found on legs patients with a frequency of 32.2% [29]. Due to the short mouth parts of sand flies and their inability to blood-feed on covered areas of the host's body, those organs (Hands, legs and face) are more likely to be bitten by sand flies and develop CL lesions. In addition, greater chemical and olfactory attractions, such as the

concentration of carbon dioxide gas, on hands and legs help sand flies to easier select their host.

One of the most important factors affecting CL is weather which is subject to various conditions such as seasons and months. The results of the present study showed that the prevalence of CL is higher in winter. On the other hand, the seasonal distribution pattern of the disease in Ahvaz well corroborates the local transmission of CL. The analysis of the last five years (2009-2013) demonstrated that most cases of CL had been registered during winter (58.6%) and then fall (19.3%). Studies conducted in Ghasreshirin City also showed that the prevalence of CL is higher in fall (34%) and winter (19%) [30]. The present research indicated that the incidence of CL does not follow the same seasonal distribution and its incidences are different throughout the year, one of the features of rural CL. But, in urban CL, the frequency of cases is stable and fixed during certain seasons of the year, and the number of cases is almost identical across all seasons.

As we know, in Ahvaz as a semi-tropical region, conditions are quite favorable for the reproduction and activity of sand flies during fall and winter. However, in very hot seasons like summer from June to September, the lowest number of CL cases has been observed in this city due to reduced activity and reproduction of vectors at this time of year. Therefore, one can simply deduce that CL is locally transmitted by sand flies in urban and rural areas of Ahvaz. The phenomenon of local transmission can exacerbate in the presence suitable reservoirs [31] and lead to the full settlement of the disease in the region and increased endemicity in Ahvaz and other vulnerable areas of this province.

Unfortunately, new centers of rural CL have been identified across Iran in the recent two decades due to population growth, increased cultivation of crops and the vegetables in different regions, development of gerbil colonies, construction of residential houses next to them, the presence of non-immune individuals in infected areas and etc. Increased cases of rural CL in Ahvaz may be attributed recent drought years, migration of a large number of villagers from other towns of this province to Ahvaz, construction of inexpensive building in suburban, population growth, abundance of vectors (such as *Phlebotomus papatasi*) and vectors (such as , *Tatera indica*), poor sanitation (unsanitary disposal of garbage and wastewater) and etc.

Based on the study findings, it can be stated that conditions and status of CL in Ahvaz are important and notable. Passage of countless individuals, mainly

non-immune ones at risk of infected *Phlebotomus* bites, for visiting war areas in spring and fall may cause the development and spread of the disease to other provinces after returning to their place of residence in the case of no awareness and prevention. The prosperity of Arvand Free Zone, increased economic activities in this zone, the establishment of Khorramshahr border customs and connection of Iran's railway network to Iraq in the future will cause further traffic of passengers in Khuzestan Province via Ahwaz-Khorramshahr and Ahwaz-Susangerd routes, especially for visiting the Holy Shrines in Iraq.

CONCLUSIONS:

Given the importance of the above-mentioned points and the course of CL in this region of Iran, more controlling measures should be taken in order to reduce the number of CL cases. Accordingly, training people about how to get CL, prevention methods, control of vectors through focal spraying, the use of insecticide-treated bed nets, environmental sanitation, rodent control and collection of stray dogs and sterilize them especially in suburban areas are recommended in this regard.

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CONFLICT OF INTEREST STATEMENT:

The authors report no conflict of interest.

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