

Assessing epidemiology of cutaneous leishmaniasis in Isfahan, Iran

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ABSTRACT

Background & objectives: Leishmaniasis has an annual incidence of 0.5–1.5 million new cases and is endemic in 88 countries throughout the world. About 90% of cases of cutaneous leishmaniasis (CL) are reported from seven countries including Iran. Evidence suggests the increased annual incidence of this disease in Iran. Intracellular protozoan parasite, *Leishmania*, is an obligatory parasite. Sandflies transfer infectious forms of the parasite or its metacyclic promastigotes to its vertebrate hosts such as humans by biting. In order to review the epidemiology of CL in Isfahan, Iran, factors such as incidence, disease causes, geographic features, age, and sex distribution, nationality, and occupation of patients, and the clinical spectrum of disease were evaluated.

Methods: During the study, 1315 patients with CL, who referred to the Dermatology and Leishmaniasis Research Center at Isfahan, were evaluated.

Results: The highest prevalence of CL was observed in fall (54%) and in northern areas of Isfahan (60.9%). Although CL was prevalent in both men and women, it had higher incidence in men (61.8%). The majority of patients (31.2%) aged 21–30 yr old. Most lesions were nodule-shaped (36.5%) and in upper extremities (48.3%) particularly in men (32.4%). While 81.2% of the subjects were Iranian, others were Afghani or with other nationalities. Most patients had multiple lesions on their bodies and 141 individuals (10.7%) had a previous history of disease. Among all occupations, the highest prevalence of CL was detected in students (18.1%). The response to treatment with compounds of meglumine antimoniate (glucantime) was better than other treatments.

Interpretation & conclusion: Unfortunately, the results showed that the prevalence of CL has been increasing annually in some provinces of Iran, especially in Isfahan Province. Nevertheless, further studies are required to determine the vectors, reservoirs, and species of disease and to design appropriate strategies to control the disease.

Key words Cutaneous leishmaniasis; epidemiology; Iran

INTRODUCTION

Leishmaniasis, a major global health and economic issue, comprises a group of diseases caused by the protozoan parasites of the genus *Leishmania*. Transmission of leishmaniasis to mammals, including humans, requires the bite of female phlebotomine sandflies^{1–3}. Rodents serve as animal reservoir hosts of this disease and infected *Rhombomys opimus*, *Meriones libycus* and *M. nesokia* have been found in Isfahan Province (Iran)⁴.

Clinical and epidemiological features of leishmaniasis vary depending upon the interactive impact of different factors such as parasites, hosts, vectors and the involved environment. Among three clinical forms (cutaneous, visceral, and mucocutaneous) of the disease, cutaneous leishmaniasis has the highest prevalence in the Middle East^{2,5}. Despite remarkable advancements in disease control, leishmaniasis is still a major health concern. The World Health Organization (WHO) has, in fact, introduced leishmaniasis as the sixth most important disease in tropical and subtropical areas⁶.

Two parasite species, i.e. *Leishmania major* and *L.*

tropica, are responsible for most of the cases of CL. Urban (dry) CL is caused by *L. tropica* and has been reported in cities of Tehran, Shiraz, Mashhad, Nishabur, Kerman, Bam, Rafsanjan and Khomeyni Shahr (Iran)^{7,8}. Rural (wet) CL, caused by *L. major*, has been found in vast areas of Iran including Isfahan, Sarakhs, Lotfabad, Khuzestan, Kashmar, Kashan, Damghan and Dehloran⁹.

Although about 20,000 cases of the disease are annually reported from different areas of Iran, the actual rate has been estimated to be five times higher^{10,11}. The prevalence of leishmaniasis in different provinces of Iran ranges from 1.8 to 37.9%⁶. As the disease keeps appearing at new sites around the country, wide national and international investments and efforts have failed to eradicate it in Iran. Since unsuccessful health and social activities to control leishmaniasis have resulted in irreparable economic, social, and psychological damages, the cutaneous leishmaniasis control program in Iran has sought to identify the epidemiological characteristics of the disease at various sites^{12–16}.

Isfahan Province, located in the center of Iran on green plains of Zayandeh Rud River, has a high prevalence of CL. The present study aimed to review the epidemiology

of this disease in the city of Isfahan (the capital of Isfahan Province).

MATERIAL & METHODS

This descriptive, analytical, cross-sectional study assessed all individuals ($n = 1733$) who referred to the Dermatology and Cutaneous Leishmaniasis Research Center (Isfahan, Iran) due to suspected CL during 2007–08. Overall, 1315 patients (75.9%) had positive leishmanin skin tests. After being examined by a physician in the health center, the patients provided informed consents and completed a special questionnaire including age, sex, occupation, lesion type, month and season of incidence, presumptive diagnosis, and type and duration of drug consumption. The lesion sites were then biopsied to confirm the diagnosis of leishmaniasis. Following fixation in methanol for 20–30 sec, the samples were stained with Giemsa (20–30 min). If *Leishmania* amastigotes were observed under the microscope, cutaneous leishmaniasis was confirmed and the patient's completed questionnaire was evaluated.

Finally, the collected data were analyzed using descriptive statistics and chi-square test in SPSS for Windows version 16.0 (SPSS Inc., Chicago, IL, USA). P -values < 0.05 were considered significant.

RESULTS

As indicated in Table 1, the prevalence of CL was

Table 2. Frequency of cutaneous leishmaniasis in different age groups of patients in Isfahan, Iran, during 2007–08

Age (yr)	n (%)
≤ 10	266 (20.2)
11–20	235 (17.9)
21–30	422 (32.1)
31–40	149 (11.3)
41–50	154 (11.7)
>50	89 (6.8)
Total	1315 (100)

assessed in northern, southern, eastern, western, and central Isfahan. While the northern area of the city had the highest number of infected individuals ($n=800$; 60.9%), the lowest rate was observed in southern areas ($n=21$; 1.6%). Out of 1315 people with leishmaniasis skin lesions, 812 (61.8%) were males, and 503 (38.2%) were females. Chi-square test showed a significant difference between the prevalence of the disease in men and women ($p < 0.01$). The highest frequency (32.1%) of patients with cutaneous leishmaniasis was detected in 21–30 yr-old subjects. However, the disease was found to infect all the age groups (Table 2). The disease had the highest and lowest frequency among 21–30 and >59 yr-old individuals, respectively. Furthermore, $>50\%$ of samples with positive leishmanin test belonged to the individuals younger than 30 are of the most active group of the population due to their occupation, education, and activity.

Table 3 summarizes sites of lesions in different months and seasons of the year. As seen, most lesions

Table 1. Frequency distribution of people with cutaneous leishmaniasis (CL) based on their place of residence in Isfahan, Iran, during 2007–08

Location	Place of living	Population	People with CL n (%)	Total percentage
North	Zeynabieh, Borkhar, Meymeh, Shahin Shahr, Malek Shahr, Dolat Abad, Habib Abad, Khorzough, Dastjerd, Agha Ali Abbas, Narmi Emamzadeh, Gorgab, Natanz and Badrud	992	800 (60.9)	57.2
South	Sepahan Shahr, Baharestan, Mobarakeh, Shahreza, Zarrin Shahr, Dehaghan, Semirom and Margh-o-Mayar	28	21 (1.6)	1.6
East	Haftshouyeh, Jarghouyeh, Ziar, Khorasgan, North Bara'an, Ghahjaverestan, Mohammad Abad, Eshkavand, Gavart, Jolgeh, Ejieh, Varzaneh, Nuclear Plant and Shahid Beheshti Airport	383	260 (19.8)	22.1
West	Lenjan, Khomeini Shahr, Najaf Abad, Koushk, Falavarjan, Pirkakran, Zob Ahan Highway, Goldasht, Dorche, Jouzdan, Asghar Abad and Kahrizsang	210	170 (12.9)	12.1
Center	Areas around Kaveh Terminal, Sofeh Terminal, Zayanderoud Terminal, Jey Terminal, Imam Square, Imam Ali Square, Hetef, Neshat	120	64 (4.8)	6.9

Table 3. Frequency distribution of patients with cutaneous leishmaniasis stratified based on months and seasons of occurrence and lesion site (Isfahan, Iran, 2007–08)

Season	Month	Lesion sites				Total number
		Head and face* n (%)	Upper extremities** n (%)	Lower extremities† n (%)	More than one organ n (%)	
Spring	April	5 (14.7)	14 (41.2)	9 (26.5)	6 (17.6)	34 (100)
	May	17 (29.3)	18 (31.1)	15 (25.9)	8 (13.8)	58 (100)
	June	8 (17.1)	18 (38.3)	15 (31.9)	6 (12.8)	47 (100)
Total		30 (21.6)	50 (36)	39 (28.1)	20 (14.4)	139 (100)
Summer	July	8 (24.2)	10 (30.3)	10 (30.3)	5 (15.2)	33 (100)
	August	17 (18.7)	31 (34.1)	25 (27.5)	18 (19.8)	91 (100)
	September	33 (20)	59 (35.8)	28 (17)	45 (27.3)	165 (100)
Total		58 (20.3)	100 (35)	63 (22.1)	68 (23.8)	289 (100)
Fall	October	25 (10.7)	90 (38.6)	31 (13.3)	95 (40.8)	241 (100)
	November	35 (13.5)	89 (34.4)	57 (22)	78 (30.1)	259 (100)
	December	26 (13.8)	59 (31.4)	48 (25.5)	57 (30.3)	190 (100)
Total		86 (12.5)	238 (34.5)	136 (20)	230 (33.8)	690 (100)
Winter	January	17 (15.5)	32 (29)	33 (30)	28 (25.5)	110 (100)
	February	6 (14.3)	19 (45.2)	9 (21.4)	8 (91.1)	42 (100)
	March	9 (20)	19 (42.2)	10 (22.2)	7 (15.6)	45 (100)
Total		32 (2.8)	70 (45.5)	52 (33.8)	43 (100)	197 (100)
Grand total (12 months)		206 (15.8)	458 (34.4)	290 (22.2)	361 (27.7)	1315 (100)

*Ear, forehead, eyes, cheeks, chin, and lips; **Neck, hand, chest, abdomen, and waist; †Legs, buttocks, and genitals.

Table 4. Frequency distribution of patients with one or multiple leishmaniasis lesions stratified based on different months and seasons (Isfahan, Iran, 2007–08)

Season	Month	Patients with one lesion n (%)	Patients with multiple lesions n (%)	Total n (%)
Spring	April	22 (2.5)	12 (1.7)	34 (2.6)
	May	36 (4.2)	19 (2.7)	58 (4.4)
	June	29 (3.3)	18 (2.5)	47 (3.6)
Total		87 (10)	49 (6.9)	139 (10.6)
Summer	July	23 (3.8)	10 (1.4)	33 (2.6)
	August	50 (8.5)	41 (5.8)	91 (6.8)
	September	72 (12)	93 (13.1)	165 (12.7)
Total		145 (24.3)	144 (20.3)	289 (22.1)
Fall	October	80 (12)	164 (22.8)	244 (17.9)
	November	99 (16.6)	160 (22.6)	259 (19.8)
	December	83 (13.9)	106 (15)	189 (14.5)
Total		262 (42.5)	430 (60.4)	692 (52.6)
Winter	January	60 (10)	50 (7.1)	110 (8.4)
	February	24 (4)	18 (2.5)	42 (3.2)
	March	25 (4.2)	20 (2.8)	45 (3.5)
Total		109 (18.2)	88 (12.4)	197 (15.1)
Grand total (12 months)		605 (46)	710 (54)	1315 (100)

occur in upper extremities (34.3%) and during fall (52.5%). Moreover, the majority of patients was Iranian (81.2%) and infected in fall (51.7%).

As Table 4 shows, the majority of patients (54%) had more than one lesion on their bodies. Moreover, the highest prevalence of multiple lesions was observed in fall (52.6%). Table 5 shows the prevalence of the usual (classic) and unusual clinical forms of cutaneous leishmaniasis among the patients in the city of Isfahan. As Table 6 shows, among various occupation, cutaneous leishmaniasis had the highest prevalence in students (18%). Finally, the most common treatment was intramuscular meglumine antimoniate (Glucantime) (24.5%) (Table 7).

DISCUSSION

Cutaneous leishmaniasis is seen in most provinces of Iran. It is an important health problem around the world particularly in Mediterranean and African countries and the Middle East. The spread of cutaneous leishmaniasis from endemic to non-endemic regions of Iran (due to environmental factors such as irregular immigration, demographic changes, development of agriculture, and water providing projects) and the consequent increase in the prevalence of the disease have imposed a considerable

Table 5. Frequency distribution of usual and unusual clinical forms of cutaneous leishmaniasis in Isfahan, Iran during 2007–08

Forms*	Clinical forms	Number of infected people	Percentage of infection**
Usual form (Classic)	Papule	20	1.5
	Nodule	400	30.4
	Ulcer Keratosis	385	29.3
	More than one clinical	34	2.9
	All classical	839	63.8
Unusual (Non-classic)	Impetigo	154	11.7
	Hyperkeratosis	36	2.7
	Erysipeloid	25	1.9
	Ecthyma	18	1.3
	Warty	7	0.5
	Sporotrichoid	4	0.3
	Tumoral	2	0.2
	Zostri	8	0.6
	Volcano-shaped	200	15.2
	Lupoid	16	1.2
	Plaque	6	0.4
	All non-classical	476	36.2
Total number of patients		1315	100

*According to Gramicci & Gradoni¹⁹; **Percentage of infection has been calculated considering the total number of patients with cutaneous leishmaniasis.

Table 6. Prevalence of cutaneous leishmaniasis among patients with different occupations in Isfahan, Iran during 2007–08

Job title	Number	Percentage
Physicians	2	0.2
Engineers	3	0.3
Nurses	6	0.5
Employees	66	5
Military*	75	5.7
Students**	237	18
Drivers	55	4.2
Workers	217	16.4
Children	214	16.3
Housekeepers	218	16.5
Retired	23	1.8
Farmers	33	2.5
Stockmen	4	0.4
Self-employed ⁺	154	11.6
Unemployed	8	0.6
Total	1315	100

*Soldiers, police officers, security guards, and patrol police; **School or university students; ⁺Tailor, panel maker, cabinet maker, quilter, sales person, fireman, chef, surveyor, shoemaker, painter, draper, and butcher.

economic and health burden on the society^{17, 18}.

Almost all the cases of cutaneous leishmaniasis (90%) occur in only seven countries, i.e. Iran, Afghanistan, Algeria, Brazil, Peru, Syria, and Saudi Arabia¹⁹. Iran not only has a high prevalence of the disease, but it is also a neighbor of Afghanistan and has close relationships and great deals of trading with Syria and Saudi Arabia. Apparently, such challenges increase the importance of the disease.

Numerous studies in different parts of the world have evaluated various aspects of cutaneous leishmaniasis. They have assessed epidemiological aspects of the disease by considering descriptive indices such as age, sex, occupation, and nationality²⁰. The present cross-sectional study tried to analyze the available statistics and demographic information to identify the relation of cutaneous leishmaniasis with epidemiological factors using 1315 patients during one year. We found most patients to be male. In a study in Shiraz and Qom (two cities in Iran) in 2008, 59.3% of the patients were male²¹. Similarly, a study from Pakistan reported 56.6% of the patients with cutaneous leishmaniasis to be male²². The very higher incidence of this disease in men compared to women can be justified by men comprising the majority of seasonal immigrants as work labor, working in open environments (farms and firms), wearing fewer parts of clothing than women, travelling more in deserts and wastelands, and having probably more contact with sandflies during evening and night. Enhancing the knowledge of seasonal workers who have to commute to endemic regions can reduce the contact rate with sandflies¹⁵.

Most patients in the present study resided in the northern part of Isfahan. Borkhar (a city in the north of Isfahan) was the main disease site as it has suitable conditions for living and reproduction of disease reservoir. On the other hand, establishment of new residential and military zones and entrance of non-indigenous people have increased the prevalence of the disease and turned the city into a hyperendemic region. Natanz is another highly infected area in the north of Isfahan due to its active mice colonies. On the other hand, Agha-Ali-Abbas pantheon, which is located near Natanz, attracts many non-indigenous and sensitive pilgrims. These people can be easily infected during their visit since abundant haloxylon trees provide a great habitat for mice colonies. Previous studies have identified *R. opimus* and *M. libycus* in rodents of Natanz. Furthermore, mice infected with *R. opimus* and *M. nesokia* have been hunted in northern areas of Isfahan¹³.

Four species of sandflies (*Phlebotomus ansari*, *P. sergenti*, *P. caucasicus*, and *P. papatasi*) have been recognized in human habitats of the five regions of Isfahan

Table 7. Prevalence of common treatments of cutaneous leishmaniasis in different months and seasons of the year (Isfahan, Iran, 2007–08)

Seasons	Months	Treatment type								Total		
		Intralesional glucantime	Intramuscular glucantime	Intralesional and intramuscular glucantime	Ointments*	Herbal ointments**	Cryotherapy	Freeze therapy	Laser therapy		More than one type	Withdrawn treatment
Spring	April	–	6	12	2	–	–	–	–	15	6	41
	May	30	12	25	18	12	–	–	–	22	12	131
	June	5	16	20	14	18	–	–	–	18	19	110
Total		35	34	57	34	30	–	–	–	55	37	282
Summer	July	4	8	6	2	8	–	–	–	2	10	40
	August	30	15	12	2	14	–	–	–	10	8	91
	September	24	25	14	6	12	2	2	1	18	15	119
Total		58	48	32	10	34	2	2	1	30	33	250
Fall	October	50	81	25	4	8	2	–	1	24	22	217
	November	54	54	28	6	6	–	–	2	10	16	176
	December	58	65	25	–	8	–	–	–	28	18	202
Total		162	200	78	10	22	2	–	3	62	56	595
Winter	January	18	24	18	14	6	–	2	–	10	8	100
	February	4	8	4	2	12	–	4	–	2	2	38
	March	10	8	10	6	2	2	–	–	–	11	49
Total		32	40	32	22	20	2	6	–	12	21	187
Grand Total (12 months)		287 (21.8)	322 (24.5)	199 (15.1)	76 (5.8)	106 (8.1)	6 (0.4)	8 (0.6)	5 (0.3)	159 (12.1)	147 (11.1)	1315 (100)

*Paromomycin, chlorpromazine, miconazole, ketoconazole, betamethasone, erythromycin, tetracycline, triamcinolone, calamine D, acyclovir, fluconazole, trichloroacetic acid (TCA) ointments, and zinc oxide; **Traditional herbal medicines like turmeric, garlic, thyme, henna, yarrow, opium, and pomegranate peel extract; Figure in parentheses indicate percentages.

Province. Therefore, both urban and rural types of CL can occur in five regions of Isfahan. In addition, the activity of rodents (with *R. opimus*) in Isfahan reaches its peak during August–December^{13, 17}.

According to our findings, frequency of cutaneous leishmaniasis was significantly related with age. In general, adults who live near disease sites and work in endemic areas are at higher risk of infection⁸.

While a study reported 51.1% of patients to the age 6–15 yr-old²³, another research found the highest prevalence among 16–50 yr old individuals²⁴. It can hence be concluded that rates of infection in different age groups depend upon the study location. In regions such as Isfahan with abundant reservoirs and vectors, people's high contact rate with them, and great number of natives, 5–6 yr old children are the most infected group^{13, 17}. Since 90% of the cases develop life-time immunity against the disease, it is very rare in adults and old people. However, in other parts of the country where the number of local people is low or the population is frequently altered, the disease can be seen in all age groups²⁵. The lesion site depends on many factors including the type of sandfly, social and cultural behavior of people, and climate. Most lesions in

the present study were in the upper extremities and face. It is clear that the body areas which are not covered are more exposed to bites of sandflies. Other studies in various parts of Iran have also suggested most lesions to occur in upper extremities, face, head, neck, and hands^{26, 27}. Similar to previous research^{17, 28}, multiple lesions were more frequent than single lesions in our study. Multiple lesions can result from receiving infected bites at different times or insemination following scratching. They can also be found along lymphatic vessels or in people with underlying diseases such as acquired immune deficiency syndrome (AIDS), renal problems, and diabetes which attenuated the immune system¹⁷. Rafati *et al*²¹, Abbasi *et al*²⁹, and Hamzavi *et al*³⁰ found >60% of the patients to have more than one lesion on their bodies. Effects of CL on beauty and general and mental health of the patients necessitate more efficient measures to control and prevent the disease.

According to Table 8, the highest incidence of CL was observed in fall followed by summer. This finding can be justified considering the biology of vector sandflies, the main vectors in the studied area. Basically, CL in humans follows a seasonal pattern in regions where adult

Table 8. Prevalence of patients with cutaneous leishmaniasis stratified based on season and month of infection, nationality, and history of the disease (Isfahan, Iran, 2007–08)

Season	Month	Previous infection			Nationality			All nationalities n (%)
		Yes		No. n (%)	Iranian n (%)	Afghani n (%)	Other* n (%)	
		Once n (%)	More than once n (%)					
Spring	April	2 (1.8)	–	32 (2.7)	29 (2.7)	5 (2.2)	1 (3.6)	35 (2.7)
	May	5 (4.7)	1 (5.6)	53 (4.5)	14 (1.3)	5 (2.2)	0	19 (1.4)
	June	2 (8.1)	1 (6.5)	45 (3.7)	53 (4.9)	6 (2.9)	1 (3.6)	60 (4.6)
Total		9 (8.5)	2 (2.1)	130 (10.9)	96 (9)	16 (7.3)	2 (7.2)	114 (8.7)
Summer	July	2 (1.8)	1 (6.5)	31 (2.6)	32 (3)	1 (0.5)	1 (3.6)	34 (2.6)
	August	15 (14)	3 (16.7)	78 (6.6)	82 (7.7)	11 (5)	2 (7.2)	95 (7.2)
	September	25 (23.3)	2 (11.1)	143 (12)	137 (12.8)	31 (14)	3 (10.7)	171 (13)
Total		42 (38.8)	6 (33.4)	252 (21.2)	251 (23.6)	43 (19.5)	6 (21.4)	300 (22.8)
Fall	October	7 (6.5)	2 (11.1)	212 (17.8)	193 (18)	44 (20.1)	7 (25)	244 (18.6)
	November	18 (16.7)	4 (22.2)	241 (20.3)	214 (20.1)	45 (20.4)	2 (7.2)	261 (19.8)
	December	8 (7.4)	2 (11.1)	181 (15.3)	145 (13.6)	43 (19.5)	5 (17.9)	193 (14.7)
Total		33 (30.7)	8 (44.4)	634 (53.4)	552 (51.7)	132 (60)	14 (50)	698 (53.1)
Winter	January	15 (13.8)	–	95 (7.9)	94 (8.8)	16 (7.3)	1 (3.6)	111 (8.4)
	February	3 (2.7)	1 (5.6)	39 (3.3)	34 (3.2)	8 (3.7)	2 (7.2)	44 (3.3)
	March	6 (5.6)	1 (5.6)	39 (3.3)	40 (3.7)	5 (2.2)	3 (10.7)	48 (3.7)
Total		24 (22.2)	2 (2.1)	173 (14.5)	168 (15.7)	29 (13.2)	6 (21.4)	203 (15.4)
Grand total (12 months)		108 (8.2)	18 (1.4)	1189 (90.4)	1067 (81.2)	220 (16.7)	28 (2.1)	1315 (100)

*Immigrants from Iraq, Pakistan, India, Malaysia, Bangladesh, Turkey, and tourists from other countries.

sandflies' growth is seasonal. In areas where adult sandflies develop in spring and early summer, new cases of CL usually appear at the end of summer or in fall³¹. In contrast to our findings, a study in Pakistan³² reported most cases of the disease in winter. Infections were found to depend on type of CL, prevalence of the vector, and disease reservoirs.

The majority of patients in this study were Iranian (82.2%). Although the incidence of first-time disease was the highest in fall, patients with a history of the disease had new lesions mostly in summer. Moreover, in our participants, classic forms of CL were more prevalent than non-classic forms. According to El-on *et al*³³, in Israel, secondary bacterial infections can be effective on both clinical forms of the disease and size of the cutaneous lesions.

In the current study, among various occupations, the highest prevalence of CL was detected in school and university students. Considering that Isfahan has a semi-arid and temperate climate, people spend hot summer nights outdoors and can thus be bitten by sandflies. On the other hand, most students aged 7–30 yr old and have not been infected by the disease; they comprise a high percentage of patients. However, Doroodgar *et al*³⁴ reported that CL had the highest prevalence among housewives in Kashan.

Intralesional glucantime, intramuscular glucantime, and simultaneous use of intramuscular and intralesional glucantime were the most common treatment modalities in all the age groups. However, since most patients had more than one lesion or had lesions on a sensitive part of their body (e.g. eyes, inside ears, nose, lips, and genitals) intramuscular glucantime was the most widely used treatment. A 20-day period of intramuscular glucantime (Specia, France) injections (20 mg/kg/day) seems to be the best method to treat CL in Iran and especially in Isfahan. The reasons include expansion of CL³⁵, identifying different species of *Leishmania* due to the exclusive effect of fluconazole, itraconazole, and ketoconazole on *L. major*²², lack of knowledge on the therapeutic effect of pentamidine^{36, 37}, and the recurrence of disease after treating with allopurinol^{38, 39}. Nevertheless, patients are recommended to be examined for the presence of cardiac, renal, hepatic and blood diseases before treating with glucantime.

CONCLUSION

According to our findings, the City of Isfahan is an important area with high CL infection rate in Isfahan Province and even in Iran. Although the number of recorded

cases of CL was 1315 in one year, the actual number can be much higher. This issue undoubtedly requires more accurate and comprehensive research. We also found gender, age, nationality, place of residence, and occupation to play major roles in the occurrence of the disease. Moreover, the disease was found to possess a seasonal pattern of incidence. More time and efforts have thus to be paid for increasing public awareness about transmission ways, prevention, and complications of infectious diseases, especially CL. Such efforts should be performed with more interaction between university hospitals and health centers in endemic and hyperendemic provinces. The importance of mass media and mass communication at the right time cannot be neglected in this regard.

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