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Original paper

Epidemiological features of cutaneous leishmaniosis and related factors in Bushehr province, southwest of Iran

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ABSTRACT. Cutaneous leishmaniosis (CL) is one of the most important known infectious skin diseases, and Iran, as a country at high risk of leishmaniosis. This research was carried out to describe the epidemiological status of cutaneous leishmaniosis during 2011–2018 years in Bushehr province. Total, 929 cutaneous leishmaniosis patients were registered in the Bushehr province during this period. Data analysis was carried out using IBM SPSS Statistics, version 22. The data were analyzed using the descriptive statistics, Chi-square test, and Fisher's exact test. The highest frequency was related to the age group of 1–10 years (35.1%). The patients consist (60.4%) males and (39.6%) females. The highest and lowest rates of disease were found in 2011 (16.3%) and 2017 (6.6%), respectively, and in January (16.6%) and September (3.2%), respectively. In terms of the ulcer number, (51%) of the cases had one ulcer, and (23%) had (3–5) ulcers. Dry ulcers made up (68.2%) of ulcers, while the wet ulcers made up (31.8%). The hands had accounted for (37%) of ulcers, the face for (25%), and the feet for (21%). Age of cases was significantly associated with the number and site of ulcers (P<0.001). As well, there was a significant relationship between gender and the number of ulcers (P<0.035). This eight-year study confirmed that in Iran, Bushehr province is one of the endemic areas for the cutaneous leishmaniosis. The increase in the patients in 2018, despite its decrease in previous years, is an alert for coming years. Effective disease prevention, control, and treatment measures are essential. Furthermore, the children, who are a vulnerable population, need the special care and treatment.

Keywords: cutaneous leishmaniosis, epidemiology, *Leishmania major*, *Leishmania tropica*, Bushehr, Iran

Introduction

The protozoan *Leishmania* parasites cause leishmaniosis, which is transmitted by the bite of infected female phlebotomine sandflies. Leishmanioses are classified as visceral, cutaneous, or mucocutaneous. Cutaneous leishmaniosis (CL) is the most common form of leishmaniosis. It causes skin lesions, mostly ulcers, on the exposed parts of body, leaving lifelong scars as well as severe disabilities or stigma. Socioeconomic conditions, malnutrition, population mobility, and environmental changes are major risk factors [1]. Leishmaniosis, a re-emerging worldwide vector-borne human disease, is a serious public health problem worldwide [2]. The cutaneous form is caused by five *Leishmania* species in the Old World: *L. major*, *L. tropica*, *L. aethiopica*, *L. donovani*, and in some cases *L. infantum* and in the New World by several phylogenetically distinct *Leishmania* species. *Leishmania* has two stages of development: amastigotes in mammals' macrophages and promastigotes in the sand fly's digestive tract [3,4].

Leishmania is endemic in 97 countries, with more than 350 million people at risk. Each year, about 50,000 and 90,000 cases of VL and 0.7 to 1.2 million cases of CL are occurring [3]. The global incidence of leishmaniosis is estimated to be more than 12 million cases, including 1.5–2 million new cases added each year, 75% of which are cutaneous

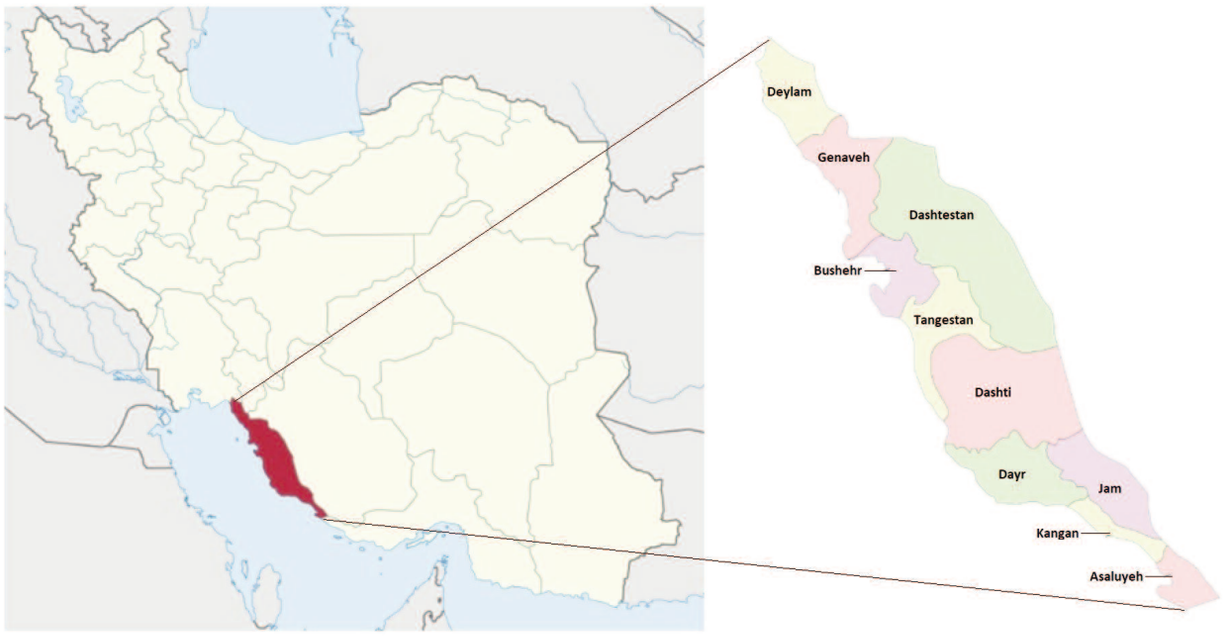

Figure 1. Geographical location and map of Busher province in Iran

forms [2]. The Americas, the Mediterranean region, the Middle East, and Central Asia account for almost all CL cases. In 2018 over 85% of new CL cases occurred in 10 countries: Afghanistan, Algeria, Bolivia, Brazil, Colombia, Iran (Islamic Republic of), Iraq, Pakistan, the Syrian Arab Republic and Tunisia. Annually, between 600,000 and 1 million new cases are estimated to occur around the world [1]. CL is endemic in the Islamic Republic of Iran. *L. major* is responsible for about 70% of CL and is endemic in many rural areas. Outbreaks are linked to population growth, unplanned urbanization, and an abundance of sandflies. ACL is found in 160 districts, affecting 9.6 million people. ZCL is present in 842 districts, putting 2.4 million people at risk [5].

Bushehr province in the southwest of Iran is one of the endemic areas for CL because of the environment‘s ideal conditions for transmission, several cases are reported each year from the province. This research was carried out to describe the status of CL in Bushehr province during 2011–2018 years and to aid in the planning of improved health care services, by focusing on the significance of epidemiological studies in disease prevention and control. We hope that the information obtained from this study will be useful to assist the officials and stakeholders in the area in planning for more desirable health services and making effective decisions for CL prevention.

Materials and Methods

Study area

This study was carried out in Bushehr province is Iran country, with a long coastline onto the Persian Gulf (28.9184°N 50.8382°E). Its center is Bushehr, the provincial capital. The province has ten counties: Asaluyeh, Bushehr, Dashtestan, Dashti, Deyr, Deylam, Jam, Kangan, Ganaveh and Tangestan (Fig. 1).

Data collection

The present study is a descriptive-cross-sectional study based on available data. The study population consists of all cases registered as infected with CL in the Bushehr State Health Department. The patients were actively and passively identified during the years 2011 to 2018. The Giemsa procedure was used to stain CL samples, which were then examined under a light microscope. Since CL is one of the most important parasitic and endemic diseases, all cases diagnosed throughout the province are registered and followed up in the Deputy of Health of Bushehr province. The patients’ medical and health care records are kept in the archives of Infectious Diseases Prevention Unit of Bushehr State Health Department. Patients’ data were collected through the checklist from the archives of Infectious Diseases Prevention Unit of Bushehr State Health Department. The patients’ demographic and epidemiological data, such as age,

Table 1. Demographic characteristics of cutaneous leishmaniosis

Variables		N	(%)	M	SD	Max	Min
Age				21.46	±17.9	80	1
Gender	Man	561	60.4				
	Woman	368	39.6				
Nationality	Iranian	816	87.8				
	Afghani	112	12.1				
	Pakistani	1	0.1				
Job	Worker	120	13.5				
	Military	42	4.7				
	Employee	31	3.5				
	Livestock /Farmer	28	3.1				
	Driver	13	1.5				
	Housewife	134	15.1				
	Students	175	19.7				
	Children (Unemployed)	223	25.1				
	Other	123	3.5				
Residence	Urban	592	64				
	Rural	327	35.4				
	Nomadic	6	0.6				

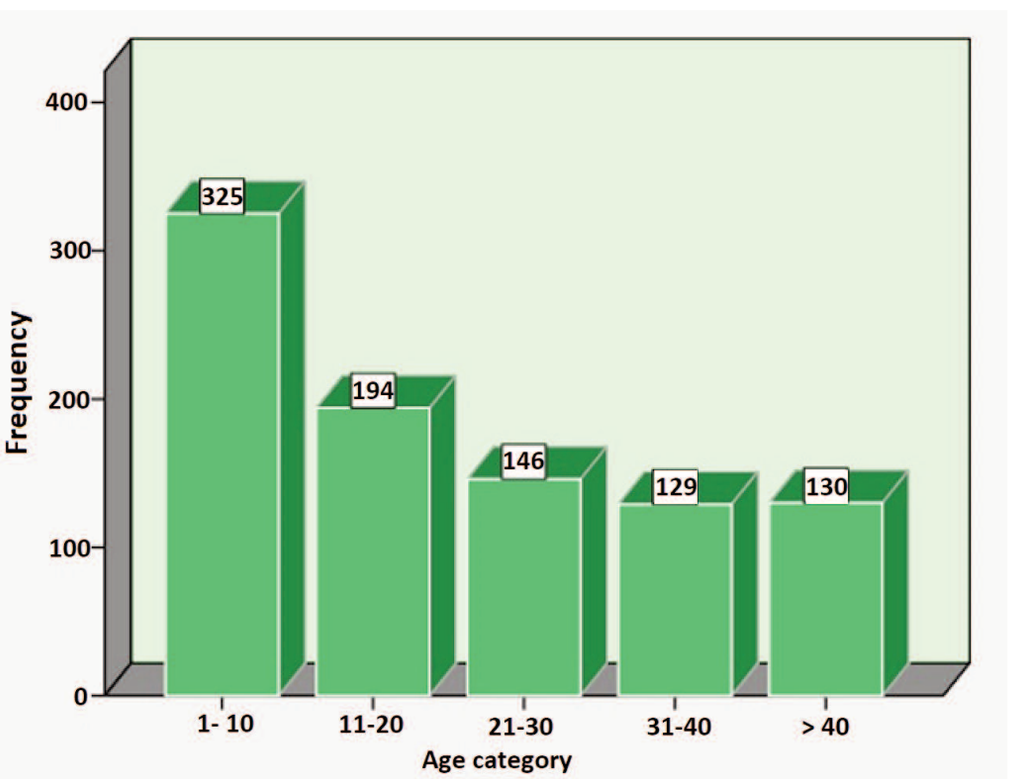

Figure 2. Distribution of cutaneous leishmaniosis by age categories

Table 2. Distribution of cutaneous leishmaniosis in Bushehr province according to age categories of patients

Age	1–10	11–20	21–30	31–40	>40	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Asaluye	1 (0.3)	5 (2.6)	3 (2.1)	7 (5.4)	1 (0.8)	17 (1.8)
Bushehr	84 (25.9)	67 (34.7)	52 (35.6)	55 (42.6)	39 (30.0)	297 (32.2)
Dashtestan	91 (28.1)	39 (20.2)	35 (24.0)	16 (12.4)	29 (22.3)	210 (22.8)
Dashti	54 (16.7	12 (6.2)	6 (4.1)	1 (0.8)	12 (9.2)	85 (9.2)
Dayyer	11 (3.4)	12 (6.2)	7 (4.8)	7 (5.4)	4 (3.1)	41 (4.4)
Deylam	6 (1.9)	7 (3.6)	4 (2.7)	4 (3.1)	9 (6.9)	30 (3.3)
Jam	16 (4.9)	8 (4.1)	5 (3.4)	6 (4.7)	4 (3.1)	39 (4.2)
Genaveh	12 (3.7)	12 (6.2)	13 (8.9)	17 (13.2)	14 (10.8)	68 (7.4)
Kangan	34 (10.5)	26 (13.5)	16 (11.0)	11 (8.5)	15 (11.5	102 (11.1)
Tangestan	15 (4.6)	5 (2.6)	5 (3.4)	5 (3.9)	3 (2.3%)	33 (3.6%)
Total	325 (100.0)	194 (100.0)	146 (100.0)	129 (100.0)	130 (100.0)	924 (100.0)
	35.1%	20.9%	15.8%	14.0%	14.1%	100.0%

gender, work, nationality, residential area, shape, site, and number of ulcers, as well as the month and year of infection, are all included in the checklist.

Data analysis

Data were cleaned up and prepared for analysis by removing and modifying data that is irrelevant, incomplete or duplicated. Data analysis was carried out using IBM SPSS Statistics version 22. The descriptive analysis included frequencies and percentages, means, and standard deviations. The Chi-square test was used to determine the association between categorical variables. The Fisher's exact test was used to examine the association among categorical variables since the study sample size and cell sizes were relatively small. The significance level was set at $P<0.05$.

Ethical approval

This research was approved by the Ethics Committee of Bushehr University of Medical Sciences (IR.BPUMS.REC.1398.34).

Results

Demographic characteristics cutaneous leishmaniosis cases

During 2011–2018 years, 929 CL patients were registered in the Bushehr province. According to the demographic characteristics of patients with CL in Bushehr province, the results are as follows. The mean age of patients was 21.46±17.9. The minimum and maximum age of the patients were 1 year and 80 years, respectively. The gender of 561 (60.4%) patients was male and 368 (39.6%) was female. 816 (87.8%) cases were of Iranian nationality, 112 (12.1%) were Afghani and 1 (0.1%) was Pakistani. The highest frequency of the disease was in children 223 (25.1%), followed by students 175 (19.7%), housewives 134 (15.1%), and workers 120 (13.5%). In terms of residence, 592 (64%) were urban, 327 (35.4%) were rural and 6 (0.6%) were nomadic (Tab. 1). Regarding the frequency distribution of people with CL by age groups, the highest frequency was related to the age group of 1–10 years, with 325 (35.1%) and the lowest frequency was related to the age group of 31–40 years with 129 (14%) and over 40 years with 130 (14.1%) patients (Tab. 2 and Fig. 2). As well, table 2 present the distribution of the cutaneous leishmaniosis in counties of Bushehr province according to age categories of patients. Regarding the distribution of the disease by year, the highest frequency of the disease was 151 (16.2%) cases in 2011 and the lowest frequency of 61 (6.6%) cases was related to 2017 (Tab. 3 and Fig. 3). The distribution of cutaneous leishmaniosis in counties of Bushehr province by year is also shown in table 3. The disease is seen throughout the year, with the highest incidence in January in 154 (16.6%) and the lowest in 30 (3.2%) in September (Fig. 4). Between 2011 and 2018, the counties with the highest incidences

Table 3. Distribution of cutaneous leishmaniosis in Bushehr province according to year (2011–2018)

Year / City	2011 N (%)	2012 N (%)	2013 N (%)	2014 N (%)	2015 N (%)	2016 N (%)	2017 N (%)	2018 N (%)	Total N (%)
Asalooye	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (2.2)	7 (11.5)	8 (7.0)	17 (1.8)
Bushehr	52 (34.7)	40 (34.5)	41 (34.7)	48 (33.6)	47 (34.8)	26 (28.9)	21 (34.4)	23 (20.2)	298 (32.1)
Dashtestan	40 (26.7)	22 (19.0)	29 (24.6)	31 (21.7)	32 (23.7)	21 (23.3)	17 (27.9)	18 (15.8)	210 (22.7)
Dashti	8 (5.3)	7 (6.0)	4 (3.4)	13 (9.1)	9 (6.7)	4 (4.4)	4 (6.6)	36 (31.6)	85 (9.2)
Dayyer	15 (10.0)	8 (6.9)	4 (3.4)	2 (1.4)	5 (3.7)	5 (5.6)	0 (0.0)	2 (1.8)	41 (4.4)
Deylam	5 (3.3)	2 (1.7)	6 (5.1)	2 (1.4)	4 (3.0)	3 (3.3)	2 (3.3)	6 (5.3)	30 (3.2)
Jam	1 (0.7)	3 (2.6)	11 (9.3)	18 (12.6)	3 (2.2)	2 (2.2)	0 (0.0)	2 (1.8)	40 (4.3)
Genaveh	2 (1.3)	14 (12.1)	11 (9.3)	6 (4.2)	6 (4.4)	9 (10.0)	6 (9.8)	15 (13.2)	69 (7.4)
Kangan	21 (14.0)	17 (14.7)	7 (5.9)	11 (7.7)	25 (18.5)	17 (18.9)	4 (6.6)	1 (0.9)	103 (11.1)
Tangestan	6 (4.0)	3 (2.6)	5 (4.2)	12 (8.4)	4 (3.0)	1 (1.1)	0 (0.0)	3 (2.6)	34 (3.7)
Total	151 (100.0)	116 (100.0)	118 (100.0)	143 (100.0)	136 (100.0)	90 (100.0)	61 (100.0)	114 (100.0)	929 (100.0)
	16.2%	12.5%	12.7%	15.4%	14.6%	9.7%	6.6%	12.3%	100.0%

of leishmaniosis were Bushehr and Dashtestan, and the counties with the lowest occurrences were Deyr, Jam, Tangestan, Deylam, and Asaluyeh (Fig. 5).

Epidemiological characteristics of cutaneous leishmaniosis cases

According to the disease characteristics of patients with CL in Bushehr province, the results are as follows. The mean number of ulcers in patients was 2.5±3.1, the minimum and maximum number of ulcers were 1 and 30 ulcers, respectively. Regarding the shape of ulcer, 620 (68.2%) cases,

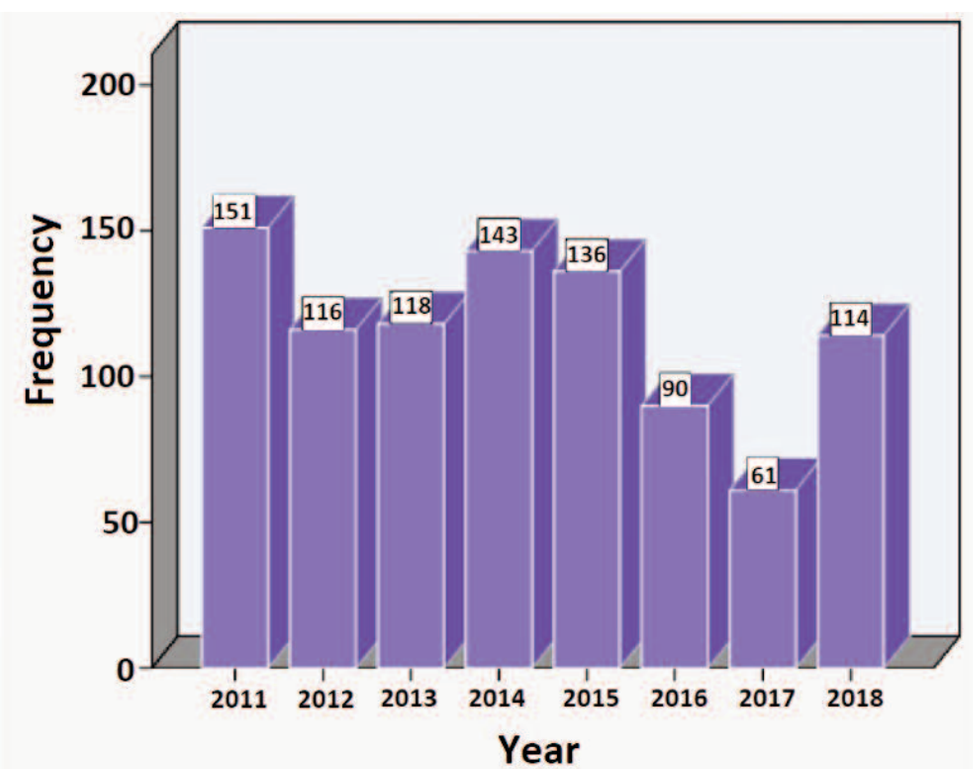

Figure 3. Distribution of cutaneous leishmaniosis by year

Table 4. Epidemiological characteristics of cutaneous leishmaniosis

Variables		N	(%)	M	SD	Max	Min
Number of ulcers				2.53	3.10	30	1
Shape of ulcer	Dry	620	68.2				
	Wet	289	31.8				
Disease cases	New	895	97.4				
	Recurrences after systemic treatment	11	1.2				
	Recurrences after topical treatment	7	0.8				
	Case failure was after systemic treatment	1	0.1				
	Other cases	5	0.5				

dry and 289 (31.8%) cases reported wet. In terms of disease cases, 895 (97.4%) new cases, 11 (1.2%) cases recurrences after systemic treatment, 7 (0.8%) cases recurrences after topical treatment, 1 (0.1%) case failure was after systemic treatment and 5 (0.5%) cases were other cases (Tab. 4). 472 (51.1%) had one ulcer, 168 (18.2%) had two ulcers, 215 (23.3%) had three to five ulcers, 44 (4.8%) had six to nine ulcers, and 24 (2.6%) had ten or more ulcers (Fig. 6). Moreover, table 5 present the distribution of cutaneous leishmaniosis by number of ulcers in counties of Bushehr province. In terms of the frequency distribution of the lesion site in patients with CL, in 344 (37.5%) ulcers were on the hands, 226 (24.6%) ulcers on the face, 191 (20.8%) ulcers on the feet, 27 (2.9%) ulcers on hands and face, 57 (6.2%) ulcers on hands and feet and 73 (8%) ulcers on other parts of the body were reported (Fig. 7). In addition, table 5 indicates the distribution of cutaneous leishmaniosis in counties of Bushehr province based on the site of ulcers.

Relationship between age group and gender with the number and ulcer site

Regarding the relationship between age group and gender with the number and location of the

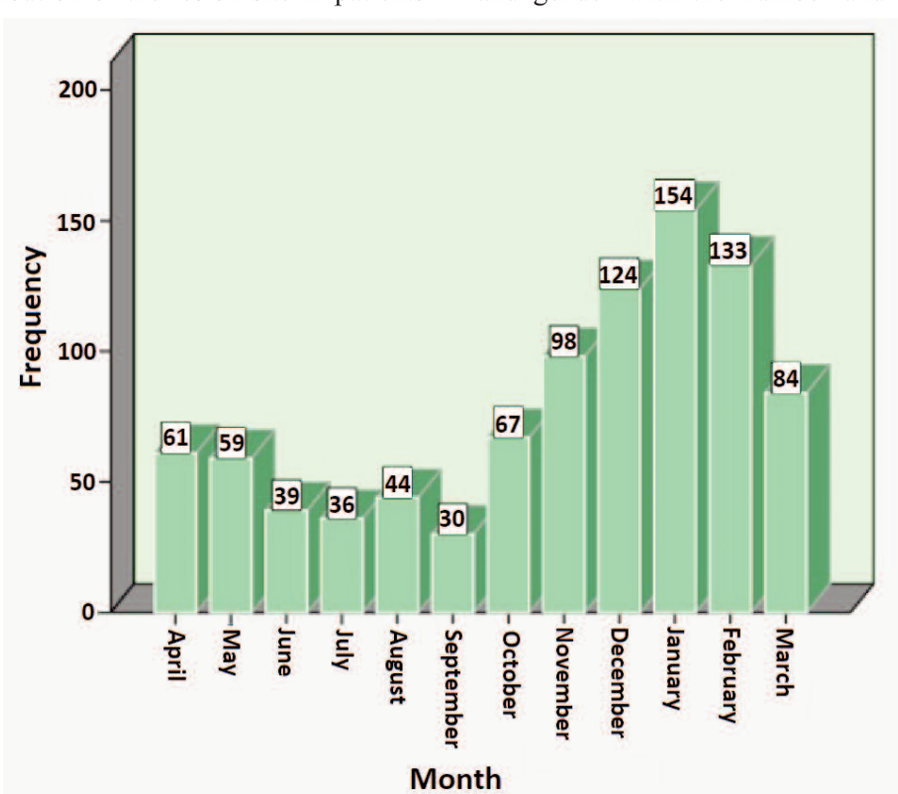

Figure 4. Distribution of cutaneous leishmaniosis by month

Table 5. Relationship between (age category and gender) and (number and site of ulcer)

Relationship between age category and number of ulcer						
Variable	1 ulcer	2 ulcers	3–5 ulcers	6–9 ulcers	≥10 ulcers	*P*-value
Age category						
1–10	178 (37.8)	66 (39.3)	65 (30.4)	13 (29.5)	3 (12.5)	
11–20	88 (18.7)	34 (20.2)	55 (25.7)	10 (22.7)	6 (25)	
21–30	66 (14)	32 (19)	33 (15.4)	10 (22.7)	5 (20.8)	< 0.001
31–40	70 (14.9)	19 (11.3)	28 (13.1)	4 (9.1)	7 (29.2)	
≥40	69 (14.6)	17 (10.1)	33 (15.4)	7 (15.9)	3 (12.5)	
Total	471 (100)	168 (100)	214 (100)	44 (100)	24 (100)	

Relationship between age category and site of ulcer							
Variable	Hand	Face	Feet	Hand and Face	Hand and Feet	Others	*P*-value
Age category							
1–10	69 (20.1)	146 (65.2)	50 (26.2)	19 (70.4)	14 (24.6)	25 (34.2)	
11–20	87 (25.4)	37 (16.5)	37 (19.4)	2 (7.4)	14 (24.6)	15 (20.5)	
21–30	68 (19.8)	14 (6.3)	35 (18.3)	4 (14.8)	12 (21.1)	12 (16.4)	< 0.001
31–40	55 (16)	11 (4.9)	42 (22)	1 (3.7)	6 (10.5)	13 (17.8)	
≥40	64 (18.7)	16 (7.1)	27 (14.1)	1 (3.7)	11 (19.3)	8 (11)	
Total	343 (100)	224 (100)	191 (100)	27 (100)	57 (100)	73 (100)	

Relationship between gender and number of ulcer						
Variable	1 ulcer	2 ulcers	3–5 ulcers	6–9 ulcers	≥10 ulcers	*P*-value
Gender						
Male	289 (61)	105 (62.5)	121 (56.5)	23 (52.3)	21 (87.5)	
Female	185 (39)	63 (37.5)	93 (43.5)	21 (47.7)	3 (12.5)	0.035
Total	474 (100)	168 (100)	214 (100)	44 (100)	24 (100)	

ulcer, the following findings were obtained. The relationship between age group and number of ulcers was significant ($P<0.001$). The majority of single ulcer (37.8%) cases, double ulcers (39.3%) cases, (3–5) ulcers (30.4%) cases, and (6–9) ulcers (29.5%) cases occurred in the age group 1–10 year. Meanwhile, most cases of 10 ulcers and more (29.2%) were found in the age group of 40–31 year (Tab. 5). Also, there was a significant relationship between gender and the number of ulcer ($P<0.035$). Male patients had a greater number of ulcers in all categories than female patients (Tab. 5). In addition, the age group and ulcer site had a significant relationship ($P<0.001$). Most cases of hand infection (25.4%) were related to the age group (11–20) year, face infection (65.2%), feet infection (26.2%), and hand and face (70.4%) infection in the age group (1–10) year, hands and feet infection (24.6%) in the age groups (1–10) and (21–30) years, and Other parts of the body infection (34.2%) were in the age group (1–10) year (Tab. 5). No significant relationship was found between the lesion site and gender ($P>0.05$).

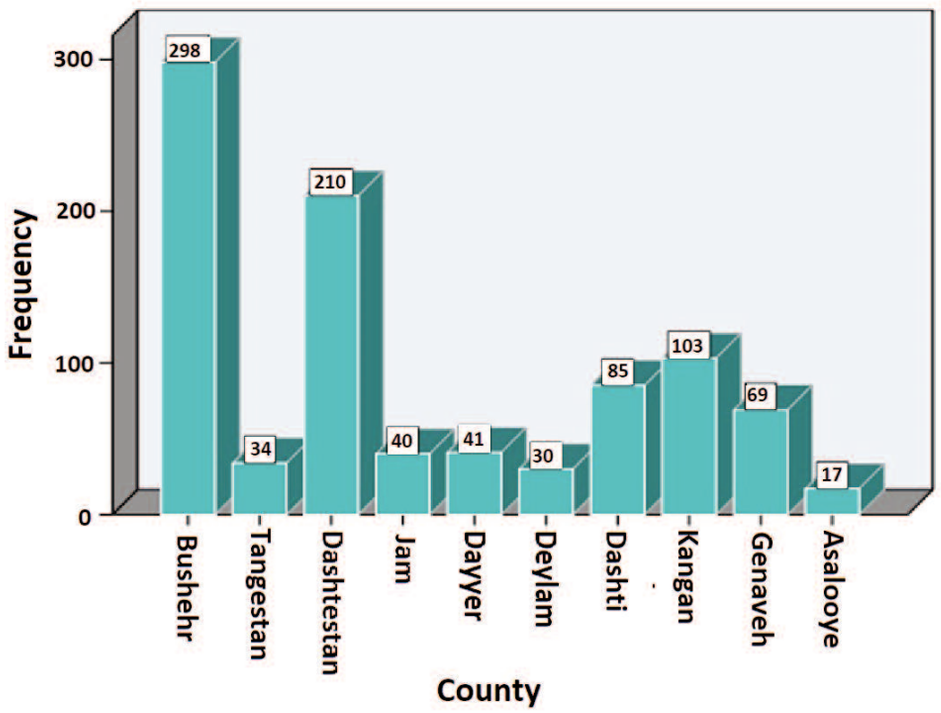

Figure 5. Distribution of cutaneous leishmaniosis by county

Discussion

This descriptive cross-sectional study aimed to determine the demographic and epidemiological characteristics of CL cases as a native parasitic disease of Bushehr province from 2011 to 2018. The mean age of the patients with CL was 21.46±17.9. The highest frequency was related to the age group of 1–10 years, with (35.1%) patients and the lowest frequency was related to the age groups of 31–40 years with (14%) and over 40 years (14.1%). Other epidemiological studies in Kashan [6,7], Larestan [8], Omidieh [9], Gonbad Kavous [10], Lamerd [11], Bushehr [12], Fars [13], Neishabour [14] and Golestan [15] found that the age group under 10 years had the highest prevalence of disease. The low mean age can be attributed to the susceptibility of children to infection, and the disease's localization in the study area, and the decrease in the number of the patients with increasing age is probably in terms of the development of immunity. On the other hand, in Gorgan [16], Damghan [17], Poldakhtar [18], Shushtar [19], Kermanshah [20] and Kashan [21] age group 20–29 had the most cases of CL. Hence, in Hamedan [22] age group 16-30 and [23] age groups 20–29 and 30–39, in Marvdasht [24] age group 15–30, in Khuzestan [25] age group 11–30, in Khorramshahr [26] and Qom [27] people over 15 years old, and Fasa [28] and Jahrom [29] the people 30 and over 30 years were the most common age group.

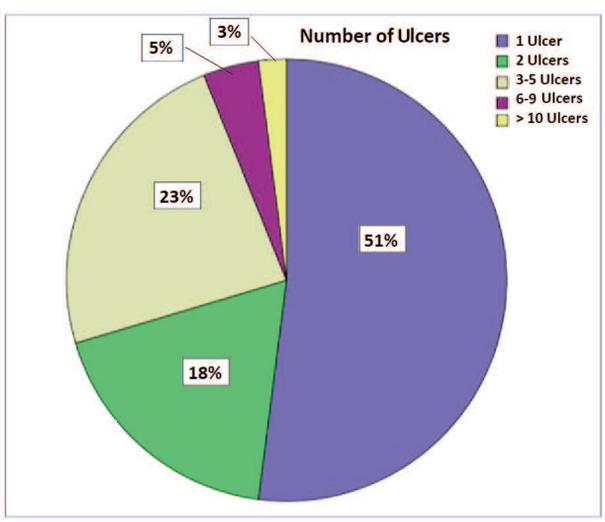

Figure 6. Distribution of cutaneous leishmaniosis by number of ulcer

The gender of CL patients in the present study (60.4%) was male, and (39.6%) were female. In the most epidemiological studies in Iran, CL was identified in more men than women: Kashan [6,7,21], Gonbad Kavous [10], Fars [13], Neyshabur [14] and Golestan [15], Damghan [17,30], Kermanshah [20], Hamedan [23], Marvdasht [24], Khuzestan [25], Khorramshahr [26], Qom [27], Jahrom [29], North Khorasan [31], Ilam [32], Khorasan Razavi [33], Isfahan [34], Dashti and Dashtestan [35]. More attendance of

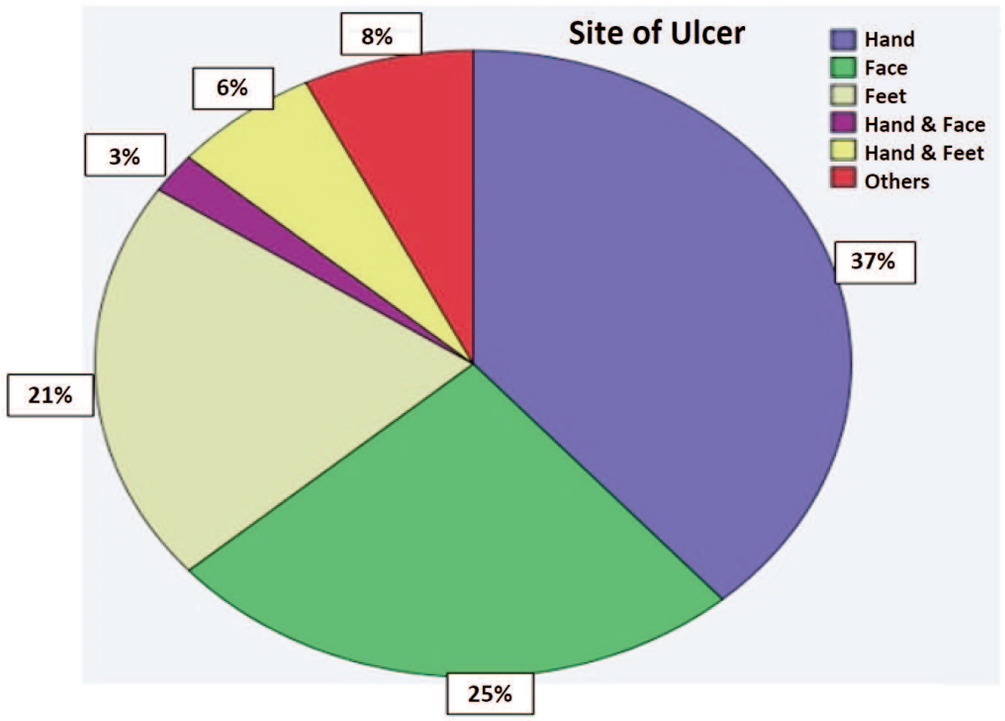

Figure 7. Distribution of cutaneous leishmaniosis by site of ulcer

men in the places where there is a possibility of mosquito bites, which can be in terms of the type of occupation, type of clothing, and social and cultural conditions, is considered an effective factor in the higher prevalence of disease in men. Meanwhile, in Larestan [8], Lamerd [11], Poldakhtar [18], Fasa [28] and Bam [36] the women were more affected by this disease.

In relation to the employment in this study, the highest prevalence of disease was observed among children and unemployed (25.1%), students (19.7%), followed by housewives and workers. In Kermanshah [20], Kashan [21], Qom [27] and Fasa [28] housewives, in Jahrom [29] students and housewives and in Khorasan Razavi [33] students had the most cases of the disease. In Fars [13], Neishabour [14] and Golestan [15] had the highest frequency was related to the housewife, followed by the child and the student, while the driver had the most cases in Hamedan [23].

Regarding the place of residence, (64%) among the subjects lived in cities, (35.4%) in rural areas, and (0.6%) in nomadic areas. In the studies of Neyshabur [14], Gorgan [16], Kermanshah [20], Kashan [21], Hamedan [23,37], Marvdasht [24], Khuzestan [25], Khorramshahr [26,38], Ilam [32], Isfahan [34], Dashti and Dashtestan [35], and the city had more patients than the village. While in Kashan [7], Larestan [8], Gonbad Kavous [10], Lamerd [11], Golestan [15], Damghan [17,30], Poldakhtar [18], Shushtar [19], Fasa [28], Jahrom [29] and North Khorasan [31] the disease was more prevalent in rural areas than urban areas. In Bushehr province, during 8 years (2011–2018), the highest cases of leishmaniosis in Bushehr and Dashtestan counties with (32.1%) and (22.7%), respectively, and the lowest cases were in Deyr, Jam, Tangestan, Deylam and Asaluyeh counties were reported.

In relation to the distribution of disease by year, the highest frequency of disease with (16.2%) was related to 2011, while the lowest frequency with (6.6%) was associated with 2017. Although the disease was observed during the year, the highest incidence of disease was observed in January (16.6%), and the lowest incidence of the disease was observed in September with (3.2%). In Bushehr [12], Kermanshah [20] and Khorramshahr [26] the highest seasonal prevalence is reported in winter. In Kashan [6,21], Gonbad Kavous [10], Fars [13], Golestan [15], Damghan [17,30], Poldakhtar [18], Marvdasht [24], Qom [27], Fasa [28], North Khorasan [31] and Isfahan [34] the highest incidence of disease occurred in the autumn. Seasonal prevalence is a characteristic of the rural form of disease which is linked to *Phlebotomus papatasi* biology and development that is associated with major changes in the months of year, and the pattern of infection in humans follows a seasonal

trend. In Neyshabur [14], Shushtar [19], Hamedan [23], Ilam [32], Khorasan Razavi [33] and Dashtestan and Dashti [35], and autumn and winter had the highest seasonal prevalence.

The mean number of ulcers in the patients was 2.5±3.1, with a minimum of 1 ulcer and a maximum of 30 ulcers. The patients with one ulcer had the highest prevalence (51%) while those with ten or more ulcers had the lowest frequency (3%). Multiple ulcers are associated with eating habits, bites, presence, and the frequency of sandflies. In the studies conducted in Kashan [6,7], Gonbad Kavous [10], Damghan [17], Poldakhtar [18], Khorramshahr [26], Qom [27], Fasa [28], Jahrom [29], Ilam [32], Khorasan Razavi [33], Isfahan [34], Dashti and Dashtestan [35] and Bam [36] the patients with one ulcer had the most cases. While the most patients in Lamerd [11] had one or two ulcers, in Fars [13] and North Khorasan [31] had one ulcer, and three ulcers or more, and in Marvdasht [24] had one to three ulcers.

Regarding the frequency distribution of lesion site in the patients with CL, (37%) ulcers were observed on the hands, (25%) on the face, (21%) ulcers on the feet. Short oral appendages of phlebotomuses, which do not allow them to eat blood from covered parts of body, increase the risk of biting and leishmaniosis in the open upper and lower limbs. As a result, the state of body covering which is affected by climatic conditions as well as cultural and social influences, is critical in deciding the location of lesion. The hand was the most common site of lesions in many epidemiological studies: Kashan [6] (46%), Kashan [7] (46%), Larestan [8] (39%), Fars [13] (49%), Neyshabur [14] (56%), Poldakhtar [18] (45%), Kashan [21] (62%), Marvdasht [24] (54%), Khuzestan [25] (46%), KhorramShahr [26] (46%), Qom [27] (49%), Fasa [28] (43%), Jahrom [29] (39%), and North Khorasan [31] (41%). Also in Omidieh [9] (74%), and in Ilam [32] (67%) cases of leishmaniosis were observed in the hands and feet. These findings are a model of the rural type of CL. While in Lamerd [11] (40%) and (38%) and Bam [36] (46%) and (42%) leishmaniosis skin lesions were on the face and hands, respectively.

Thus, in relation to the shape of lesion, (68.2%) dry and (31.8%) wet were reported. The predominant clinical manifestation of skin lesions in many studies in Iran was wet which is one of the characteristics of the rural CL with *Leishmania major*: Kashan [7], Omidieh [9], Gonbad Kavous [10], Fars [13], Damghan [17,30], Shushtar [19], Marvdasht [24], Khorramshahr [26], Qom [27], Ilam [32], and Fasa [28]. On the other hand, in the studies conducted in Neyshabur [14], Jahrom [29] and Khorasan Razavi [33] dry form was reported as the predominant species, which is related to urban CL with *Leishmania tropica*.

Bushehr province is considered one of the endemic centers of rural CL caused by *Leishmania* major, according to the information obtained from Hamzavi et al. [39] during years 1983–1999. During the study period, the disease's mean incidence was around 1.85 cases per thousand people, with frequent variations among years, and at least two major epidemics occurred in 1988 and 1997, with the incidences of 5.25 and 6.57 cases per thousand, respectively. Most cases of the disease were reported in the autumn and winter which is one of the important features of the rural type of disease, and usually a wet ulcer form. According to a study conducted by Rahmanpour et al. [12] in Bushehr County from 2011 to 2015, years 2011 and 2012 had the highest and lowest number of the patients with CL, respectively. The months of February and September, the highest and lowest cases, and winter and summer had the highest and lowest seasonal prevalence. The incidence of leishmaniosis was higher in men than in women. The largest numbers of the patients in the age groups 0–9 years, and lowest numbers were found in the age groups of 69–60 and 70 years and above. Therefore, the above study is similar to the present study in terms of the gender, age, and prevalence. Besides, a study conducted in Dashtestan and Dashti cities in Bushehr province from 2013 to 2014 revealed that CL is endemic in Dashtestan city [35]. The highest percentage of infections occurred in 2013 in the age group from 0 to 4 years, but in 2014 it was in the age group from 15 to 24 years. The incidence of disease in men was higher than in women. During two years, the disease was most prevalent in the winter and autumn. Unlike the present study, the incidence of skin lesions on the face was more frequent.

In conclusion, this 8-year (2011–2018) study confirmed that in Iran, Bushehr province is one of the endemic areas for CL based on the demographic and epidemiological characteristics. Most cases of CL were related to Bushehr and Dashtestan counties. The children, who are particularly the vulnerable population in Bushehr province, should be given special care and treatment. The highest prevalence of CL patients, as well, most cases of face infection, and the number of single, double,

(3–5) and (6–9) ulcers occurred in this age group. This study emphasized the greater number of ulcers in male patients in all categories of single, double, (3–5) and (6–9) and ≥10 ulcers. Despite the decrease in the number of the patients in 2016 and 2017, the increase in the number of cases in 2018 should be considered a warning for future years. Effective disease prevention, control, and treatment measures are essential because of the favorable climatic conditions for sandfly activity and the high prevalence of CL in this area. Molecular epidemiological studies and *Leishmania* species identification, the evaluation of CL reservoirs, and the treatment process of CL patients are recommended.

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