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COVID -19 PANDEMIC AND EPIDEMIOLOGICAL PATTERN OF CUTANEOUS LEISHMANIASIS OCCURRENCE IN IRAN

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Abstract

Limited data is available on the impact of pandemic on the epidemiological pattern of cutaneous leishmaniasis (CL) worldwide. The aim of this study was to investigate the relationship between Covid-19 pandemic and the occurrence of CL. Patients' data in one-year interval, before the Covid-19 pandemic and the same timespan during Covid-19 pandemic that were clinically and laboratory confirmed were extracted from the Leishmania center of Bam city. Demographic data and disease characters including sex, age, frequency and location of lesion and treatment was statistically analyzed. The frequency of CL is cases in the time interval before the Covid-19 pandemic (168 patients) was higher than the same timespan during the pandemic (119 patients). The majority of cases (156) were women. The mean age of patients was 29.91±21.60. No significant differences were observed in age, sex, number of lesions, treatment regimen, duration of treatment and location of skin lesions in patients before and during the Covid-19 pandemic. Current study showed that the frequency of CL in Bam city, an important endemic area of CL, during the Covid-19 pandemic has decreased compared to the time before pandemic but there was no significant difference in terms of mean age, sex of patients, number of lesions, length of treatment, treatment regimen and location of lesions before and during the Covid-19 pandemic. Further studies are needed on the role of the Covid-19 pandemic in the epidemiological pattern of CL.

Keywords: *Cutaneous Leishmaniasis, Covid-19. Pandemic, Leishmania infection, Iran*

Introduction

Leishmaniasis is a zoonotic vector-borne disease and major health problem in endemic areas that is caused by different species of *Leishmania* parasite [*Steverding, 2017*]. The disease is a multifaceted disease from self-healing cutaneous leishmaniasis to fatal visceral form. Approximately, 12 million people worldwide are affected by the disease, and 350 million are at risk. It is estimated that 1.3 million new cases occur each year and lead to more than 20,000 to 30,000 deaths annually [*Steverding, 2017*]. Cutaneous leishmaniasis (CL) is the most common type of leishmaniasis and is endemic in many countries of the world. There are two major types of CL in the Old World. The first type is zoonotic cutaneous leishmaniasis (ZCL) caused by the *Leishmania major* and the second type is anthro-

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ponotic cutaneous leishmaniasis (ACL) caused by the *Leishmania tropica* [*Abedi-Astaneh et al., 2016; Aronson & Joya, 2019a; Sabzevari et al., 2021*]. Although, more than 75% of cases of CL are reported from only 6 countries, Iran is recognized as one of the most important endemic diseases with 20,000 new cases annually [*Badirzadeh et al., 2017; Karimkhani et al., 2016*]. There are several studies that have reported CL from 18 out of 31 provinces in Iran with different clinical features and diverse epidemiological characteristics [*Shirzadi et al., 1995*]. The clinical manifestations of different types of CL depend on the complexity of the host immune responses, parasite species, and diverse biological interactions between the causative agent and reservoir host [*Bennis et al., 2017; Chahed et al., 2016; Yanik et al., 2004*]. Corona viruses are a large group of viruses that have been responsible for a variety of manifestations, from the common cold to deadly epidemics, including Middle East Respiratory Syndrome (MERS-CoV), Acute Respiratory Syndrome (SARS-CoV) and Covid-19 [*Yan et al., 2020; Yin & Wunderink, 2018*]. Covid-19 was first reported in December 2019 in Wuhan, China, and spread around the world and has been responsible for the deaths of millions worldwide [*Huang et al., 2020*]. The disease is caused by a virus called SARS-CoV-2, which is a single-stranded RNA virus of the coronavirus type [*Liu et al., 2020*]. Research on this pandemic has shown that the transmission of SARS-CoV-2 virus is through respiratory droplets as well as through fecal-oral route [*Gu et al., 2020*]. Thus, since the beginning of the Covid-19 pandemic, social distancing, quarantine, and the use of protective devices, including masks and gloves, have become one of the principles of public health in different communities. The spread of this pandemic has affected the pattern of some other diseases. On one hand, due to the fear of going to medical centers or the closure of non-coronary wards in many medical centers, the number of referrals of patients with other diseases may have been affected and changed the actual occurrence of these diseases and on the other hand, quarantining principles and individual distance and reducing risk factors for some pathogens may also have affected the epidemiological pattern of some diseases. Meanwhile, due to the

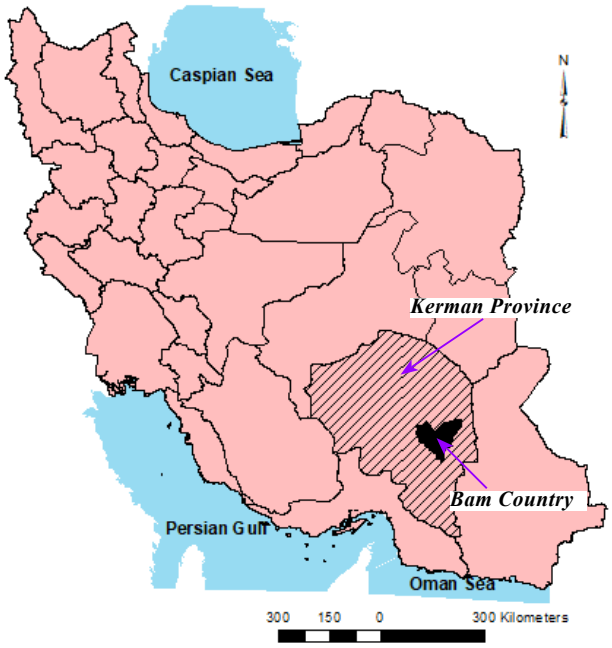

FIGURE 1. investigate the effect of corona pandemic on the occurrence of Cutaneous leishmaniasis in Bam city in 2018-2019

transmission of CL by sandflies, the use of masks and gloves as personal protective equipment against coronavirus, as well as quarantine and less exposure to risk factors, may also affect the occurrence and pattern of CL. Considering that Kerman province and especially Bam city is among the endemic areas with high occurrence of CL in Iran, the study of epidemiological changes of this disease in this region is of great importance. Therefore, the present study was designed to investigate the effect of corona pandemic on the occurrence of CL in Bam city in 2018-2019.

MATERIAL AND METHODS

Studied area

Kerman Province with the population of 3 million people covers the area of 181714 km located in southeast Iran. It is the largest province of Iran and covers 11% of total land of the country (fig 1). The province consists of 23 districts and Bam County has the highest prevalence of CL with almost all ACL cases in this region. Recently sporadic cases of *L. major* have been reported in rural areas of Bam [*Sharifi et al., 2015*].

In current study, referred patients to the Bam *Leishmania* Center were confirmed as Leishmani-

asis by microscopic examination in the timespan of 2018 to 2019. Demographic information of patients was retrieved including referral year, age, gender, location of the lesion, number of lesions, treatment regimen, treatment dose, duration of treatment and treatment outcome. The collected data were analyzed by SPSS software (V 22, Chicago, IL, USA). Descriptive statistics including frequency, percentage, mean and standard deviation were used to describe the data. Chi-square, Fisher's exact test and Mann-Whitney test were used to compare the variables. Significance level of *p* value in this study was considered 0.05.

Results

During the study period, a total of 287 patients were evaluated based on the inclusion and exclusion criteria. Result of study showed that the mean age of patients was 29.91±21.60 years and average number of skin lesions was 1.64±1.33 (Table 1). More than half (54.4%) of the patients were women. (Table 2). The results of study showed that the more patients referred to the leishmaniasis center in timespan before the Covid-19 pandemic and during pandemic Covid-19 were women. No significant difference was observed between the male and female infection before and during Covid pandemic (p = 0.75).

The most reported lesions were in the hands (53.7%), face (30.3%) and lower limbs (18.1%), respectively. The location of the lesion on other parts of the body was reported in less than ten percent of cases. (Table 3). The results of study showed that the number of referred cases of CL to the leishmaniasis center in timespan before the Covid-19 pandemic was 168 cases and in the same timespan during Pandemic Covid-19 was 119 cases, which indicates a reduction in cases of CL.

Table 1.

Mean and standard deviation of age, weight, number of lesions, drug dose and duration of treatment

Variables	SD ± Mean	Min	Max
Age(year)	29.91±21.60	1	87
Weight (*kg*)	51.95±23.39	5	110
Number of lesion	1.64±1.33	1	9
Drug dose (*mg/kg*)	2.24±3.68	0.1	10
Treatment Duration (*days*)	45.67±26.86	5	84

Table 2.

Frequency distribution of sex, treatment regimen and disease outcome of the studied patients

Variables		Number(%)
Sex	Men	131 (45.6)
	Women	156 (54.4)
Treatment	Local	194 (72.1)
	Intramuscular	71 (26.4)
	Cryotherapy	4 (1.5)
Outcome of disease	Absence	37 (27.2)
	Recovery	75 (155.)
	Improving	24 (17.7)

Table 3.

Frequency distribution of skin lesions in the studied patients

Skin involvement		Number(%)
Face	-	200 (69.7)
	+	87 (30.3)
Hand	-	133 (46.3)
	+	154 (53.7)
Forearm	-	279 (97.2)
	+	8 (2.8)
Arm	-	276 (96.2)
	+	11 (3.8)
Body	-	282 (98.3)
	+	5 (1.7)
Lower limbs	-	235 (81.9)
	+	52 (18.1)

Table 4.

Comparison of age, weight, number of lesions, drug dose and duration of treatment of patients before and during Covid-19 pandemic

Variables	Covid-19 pandemic		p-value
	During	Before	
Age	31.07±20.61	29.00±22.38	0.23
Weight	54.14±21.76	50.17±24.57	0.19
Number of lesions	1.72±1.43	1.59±1.25	0.64
Drug dose	2.61±3.97	1.95±3.43	0.13
Treatment duration	34.80±20.39	46.53±27.19	0.20

The results of study showed that the mean age of patients referred during the pandemic was higher than before the pandemic, but difference was not statistically significant (p = 0.23). The mean number of patients' lesions during and before the pandemic was not significant (p = 0.64). (Table 4).

The location of skin lesions in patients with CL investigated separately before and during the Covid-19 pandemic. Results of study showed that facial involvement during the Covid-19 pandemic has increased from 29.2% to 31.9% compared to before the Covid-19 pandemic. Hand involvement decreased from 55.4% to 51.3%. Forearm involvement has increased from 1.2% to 5%. Trunk involvement decreased from 2.4% to 0.8% and lower limb involvement decreased from 19% to 16.8%. Statistical tests showed that there is no statistically significant difference between the site of skin involvement before and after the pandemic (Table 5 and 6).

Discussin

In current study, for the first time, the frequency and pattern of CL were investigated in the two timespan before and during the Covid-19 pandemic. The findings of our study showed that in a one-year period study, the number of referred cases of CL in Bam city, during the Covid-19 pandemic (119 patients) decreased compared to the time before the pandemic (168 patients). Studies have shown that not leaving the home in endemic areas exposed to sandfly bites may be effective in reducing the incidence of CL. Few studies have found that covering the skin surface is effective in reducing mosquito bites [*Aronson & Joya, 2019b; Soto et al., 1995; Stockdale & Newton, 2013*]. The reduction in the incidence of CL during the Covid-19 pandemic in our study may perhaps reflect the fact that due to quarantine, reduced outdoor activities and exposure to risk factors and the use of gloves and masks may have been effective in reducing contact with the bite. Also as Bamorovat et al. recently showed that there may be an immunological relation to CL and Covid-19 [*Bamorovat et al., 2021*]. However, more epidemiological and immunological studies are needed to understand this issue. Some other studies have reported changes in the pattern of skin diseases in the Covid-19 pandemic. Also some skin diseases have been reduced with the beginning of the Covid-19 pandemic [*Kutlu & Metin, 2020*]. In line with our study, Kutlu et al. reported that contagiosomes, stomatitis and seborrheic dermatitis were significantly reduced in the first month after the development of Covid-19 pandemic [*Kutlu & Metin, 2020*]. Fur-

Table 5.

Comparison of gender frequency, treatment regimen and disease outcome of patients before and during Covid-19 pandemic

Variables		Covid-19 pandemic		p-value
		During	Before	
Sex	Men	53 (44.5)	78 (46.4)	0.75
	Women	66 (55.5)	90 (53.6)	
Treatment	Local	82 (68.9)	112 (74.7)	0.59
	Intramuscular	35 (29.4)	36 (24.0)	
	Cryotherapy	2 (1.7)	2 (1.3)	
Outcome of disease	Absence	3 (25.0)	34 (27.4)	0.32
	Recovery	5 (41.7)	70 (56.5)	
	Improving	4 (33.3)	20 (16.1)	

Table 6.

Comparison of the frequency of skin lesions in patients before and during the Covid-19 pandemic

Skin involvement		Covid-19 pandemic		p-value
		During	Before	
Face	-	81 (68.1)	119 (70.8)	62.0
	+	38 (31.9)	49 (29.2)	
Hand	-	58 (48.7)	75 (44.6)	49.0
	+	61 (51.3)	93 (55.4)	
Forearm	-	113 (95.0)	166 (98.8)	0.07
	+	6 (5.0)	2 (1.2)	
Arm	-	114 (95.8)	162 (96.4)	0.77
	+	5 (4.2)	6 (3.6)	
Body	-	118 (99.2)	164 (97.6)	0.41
	+	1 (0.8)	4 (2.4)	
Lower limbs	-	99 (83.2)	136 (81.0)	0.63
	+	20 (16.8)	32 (19.0)	

thermore, the fear of infection of Covid-19 may affect the rate of referral of patients with other diseases to medical centers. Lazzerini et al. showed that with the beginning of the Covid-19 pandemic, the number of patients referred to the hospital decreased about 73 to 88% compared to the same period before the Covid-19 pandemic [*Lazzerini et al., 2020*]. In another study, the rate of referrals to medical centers decreased by 42% compared to the past [*Hartnett et al., 2020*]. Remarkably, in addition to non-emergency diseases, the decrease in referrals also included emergency diseases such as heart attack [*Metzler et al., 2020*]. Therefore, it should be noteworthy that patients with CL may also refrain from visiting leishmaniasis centers, which can lead to reduction of the frequency of registered cases. Consequently, one of the points that seems necessary is to adopt policies for public education. The importance of timely referral in the diagnosis and treatment of CL could be able to accurately record and investigate the incidence of disease during the Covid-19 pandemic. The studies during a 20-year study of the pattern of CL were shown that before the Bam earthquake, earthquake in 2003 that resulted to Bam massive destruction and catastrophic mortality, the occurrence of the disease was higher in females and after the earthquake, this ratio was almost reversed [*Aflatooniyan & Sharifi, 2010; Ghatee et al., 2020; Khosravi et al., 2017*]. Nevertheless, findings of our study showed that the occurrence of CL in women was higher than men. This finding confirms the meta-analysis study conducted by Sabzevari et al. who estimated the overall occurrence of CL in women and men 0.94% and 0.68%, respectively, in Iran [*Sabzevari et al., 2021*]. Our study also showed that the incidence of Covid-19 pandemic had no effect on the sex distribution of CL, so that before and during the Covid-19 pandemic, the occurrence of CL was about ten percent higher in women than men. In a study conducted by Khosravi et al. in Kerman province between 1996 to 2014, the mean age of patients with CL was 19.6 ± 24.6 years [*Khosravi et al., 2017*]. Compared to the findings of our study, that indicates that currently the average age of patients in Bam is about 5 years higher than the same study conducted in the whole of Kerman province. Some studies have considered this upward trend of the average age in Bam city due to demographic changes and migration after the earthquake [*Aflatooniyan & Sharifi, 2010*]. Tough, findings of our study showed that the mean age of patients with CL during the Covid-19 pandemic was higher than before the pandemic, there was no statistically significant difference in age and it seems that the incidence of Covid-19 pandemic had no an effect on the age range of CL patients. The findings of our study showed that currently the most common skin lesions of CL in Bam are the hands, face and lower limbs, respectively. Sharifi et al. reported the most of the lesions in the face before the earthquake, but after the earthquake, according to our study, these lesions were mainly in the hands [*Sharifi et al., 2015*]. Comparing the pattern of skin involvement before and during the Covid-19 pandemic, our study showed that there was no significant difference between the location of skin involvement in patients referred before and during the Covid-19 pandemic. However, it was observed that the incidence of lesions in the hand area at the time of the Covid pandemic (51.3%) decreased compared to before the Covid pandemic (55.4%); Therefore, more extensive studies on the extent to which the use of gloves can change the pattern of the lesion may be helpful.

Conclusion

Our study showed that the frequency of CL in Bam city during Covid-19 pandemic has decreased compared to the time before the pandemic but there was not a significant difference in terms of mean age, sex of patients, number of lesions, length of treatment, treatment regimen and location. The present study can be the basis of further studies on the role of the Covid-19 pandemic in the epidemiological pattern of CL and population policies for the diagnosis and control of this disease during the pandemic.

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