

Comparison of Cutaneous Leishmaniasis Patients in One-Year Pre-Outbreak and One-Year Post-Outbreak of COVID-19 in Shiraz City, Iran

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Abstract- Iran ranks among the top ten countries for leishmaniasis and COVID-19 outbreaks. This study compared cutaneous leishmaniasis (CL) cases in Shiraz one year before and one year after the COVID-19 outbreak. In this study, the recorded information of 988 suspected cutaneous leishmaniasis (CL) patients referred to Valfajr Health Center was meticulously collected, prepared, and analyzed using the SPSS-24 Software and the Chi-square test. Comparing the pre-outbreak period (February 2019-March 2020) to the post-outbreak period (March 2021), 57.9% of 526 suspected CL cases were positive before the outbreak versus 76.4% of 462 cases after the outbreak. Pre-outbreak, women constituted 53.8% of CL cases, whereas post-outbreak, men constituted 55.8% of cases. The presence of underlying conditions, notably diabetes and hypertension, increased 3.5 times after the COVID-19 outbreak. Employment status also shifted, with increases in employed (from 5.3% to 10.5%) and self-employed (from 44.4% to 47.7%) individuals and a decrease in housewives (from 48.3% to 37.6%). COVID-19 has significantly impacted CL parameters, particularly gender distribution, employment status, and the acute-chronic nature of the disease, due to increased economic activity and community presence.

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Introduction

Leishmania is a single-celled protozoan transmitted by sand fly bites, particularly in 98 countries in tropical and subtropical regions in Asia, Africa, the Americas, and Europe, causing a complex of worldwide diseases called leishmaniasis (1). Over 300 million people are at risk of leishmaniasis, and approximately 12-15 million are infected yearly (2). Based on the different manifestations of leishmaniasis, the disease is categorized into various forms, including cutaneous leishmaniasis (CL), mucocutaneous leishmaniasis (MCL), visceral leishmaniasis (VL), diffuse cutaneous leishmaniasis (DCL), and post kalaazar dermal leishmaniasis (PKDL) (3). In 2015, the world health organization (WHO) reported about 1.5 million new cases of CL reported

annually and 0.5 million new cases of VL. About 70% of CL occurred in Iran, Afghanistan, Algeria, Sudan, Nicaragua, Colombia, Ethiopia, and Brazil (4). Visceral and cutaneous forms of leishmaniasis are found in Iran, especially in half of Iran's provinces (17 out of 31), such as Isfahan, Fars, Khuzestan, Kerman, Azerbaijan, and Khorasan. Zoonotic cutaneous leishmaniasis (wet or rural form) caused by *L. major* and anthroponotic cutaneous leishmaniasis (dry or urban form) caused by *L. tropica* is the main form of CL in Iran. In general, the different species of *Leishmania* are obligate intracellular parasites that can infect their host by suppressing cellular immunity. In the course of the disease, depending on the species of parasite, the immune system activates parasite control mechanisms and self-healing may be observed. However, the parasite is not completely eliminated from

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the body and may remain latent in some cells (5,6).

A new SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) virus, formally named the coronavirus by the WHO, is one of the beta-coronavirus family transmitted to humans and causes severe lower respiratory tract infections (7). The disease is highly contagious; each infected person can infect at least three other people (8). It was first reported in December 2019 in Wuhan, China, and then spread rapidly worldwide, affecting 206 countries with nearly 300,000 approved patients and 11,000 deaths by April 3, 2020 (9). Iran is one of the countries most affected by COVID-19, along with Germany, China, Italy, the United States, and Spain. In February 2019, in Qom, for the first time in Iran, the disease was officially declared and quickly spread to 31 Iranian provinces, suffering the worst complications of the COVID-19 epidemic (10-12).

Unlike previous studies that evaluated CL trends over multi-year intervals or focused primarily on ecological or vector-related factors, the present study is among the first to directly compare the epidemiological, clinical, and demographic patterns of CL in Shiraz City as a large urban center before and after the COVID-19 outbreak using a large dataset of 1000 suspected cases. This direct pre-/post-pandemic comparison provides unique insights into how major public-health disruptions influence CL incidence, chronicity, sex distribution, occupational exposure, and underlying health conditions.

Materials and Methods

This study was conducted one year before the outbreak of COVID-19 (since February 2019) and one year after the outbreak (since March 2021). Our information was obtained from 988 CL suspects referring to Valfajr Health Center in Shiraz City from early February 2019 until the end of March 2021.

All suspects were examined using a smear, and CL patient demographic information, including gender, age, work status, place of residence (urban or rural), nationality, and travel history, was recorded. The type of lesion (acute or chronic/dry or wet), the size and lesion site in the body, the season, the month, and the time of diagnosis of the infection are recorded as specific details. For statistical analysis, all variables were classified into relative groups. After preparation and division for database analysis, they were entered into SPSS24 software. All data were analyzed using the chi-square test at a significant P of 0.05.

Results

Before the outbreak of COVID-19, from February 2019 to February 2020, of 526 suspected leishmaniasis persons, 305 individuals (57.9%) were positive. After the epidemic, from February 2019 to February 2021, of 462 suspect CL cases, 353 individuals (76.4%) were positive. Figure 1 shows the frequency of suspects and positive cases of CL patients from February 2019 to February 2021. The frequency of suspicious and positive cases was higher in autumn and winter than in spring and summer. This trend was similar in pre- and post-outbreak of COVID-19. Table 1 shows the demographic characteristics of CL patients referred to Valfajr Health Center in Shiraz during the one-year pre-outbreak of COVID-19 and at the same time post-outbreak.

Most patients were between 20 and 60 years old; the mean age of patients in both periods was similar, and no significant difference was observed. According to the results of this study, there was a significant difference in gender before and after the COVID-19 outbreak. In the year before the outbreak of COVID-19, most patients (53.8%) were female, while after the outbreak of COVID-19, most patients were male (55.8%) ($P=0.014$). Also, the working status of patients before and after the outbreak of COVID-19 was significantly different: nationality, habitat, and travel history in patients before and after the outbreak of COVID-19 were similar and did not differ significantly, but the role of underlying disease in CL patients during COVID-19 was significantly higher than the same period last year ($P=0.002$). Twenty patients had diabetes, and five patients had high blood pressure. Table 1 shows the results of comparing the characteristics of CL disease in patients with leishmaniasis referred to Valfajr Health Center in Shiraz before and after the outbreak of COVID-19. The number of patients with chronic leishmaniasis after COVID-19 (29 patients) was significantly higher than in the same period last year (16 patients) ($P=0.012$). The lesion site in patients was similar in the hands, legs, and faces of patients in the two study times, and there was no significant difference. Of the 305 patients, 55 patients (18.0%) had lesions in more than one part of the body before the outbreak, and at the same time after the outbreak, this number increased to 353 patients, with 57 patients (16.1%) affected. The mean lesion size, number, and treatment received by patients in the two periods studied were similar, with no significant difference.

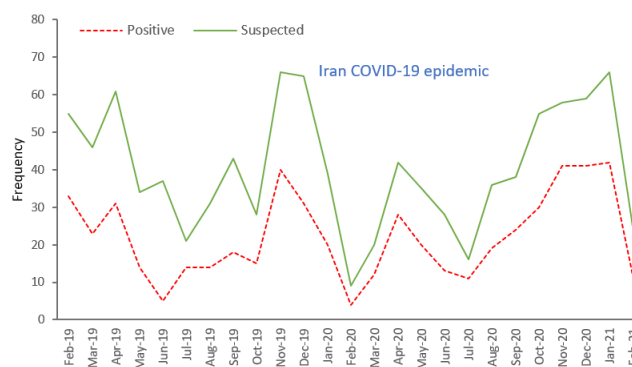


Figure 1. The frequency of suspected individuals and positive cases of leishmaniasis from 19 February 2019 to 18 February 2021, in Shiraz, Iran

Table 1. Comparison of demographic characteristics of CL patients referred to Valfajr Health Center in Shiraz City during the one year before and after the Covid-19 outbreak

Variable	Pre-outbreak	Post-outbreak	P
Age (years)	22.1 ± 33.8	20.4 ± 34.6	0.654
Age group			
0–10 years	57 (18.7%)	56 (15.9%)	
10–20 years	48 (15.7%)	55 (15.6%)	
20–40 years	84 (27.5%)	95 (26.9%)	0.438
40–60 years	80 (26.2%)	114 (32.3%)	
>60 years	36 (11.8%)	33 (9.3%)	
Gender			
Female	164 (53.8%)	156 (44.2%)	0.014
Male	141 (46.2%)	197 (55.8%)	
Nationality			
Iranian	261 (85.6%)	300 (85.0%)	0.832
Afghani	44 (14.4%)	53 (15.0%)	
Occupation			
Employed	11 (3.6%)	27 (7.65%)	
Housewives	100 (32.8%)	97 (27.47%)	0.029
Freelance	92 (30.2%)	123 (34.84%)	
Unemployed	4 (1.3%)	11 (3.1%)	
Habitat			
Urban	271 (88.9%)	326 (92.4%)	0.123
Rural	34 (11.1%)	27 (7.6%)	
Travel history	12 (3.9%)	11 (3.1%)	0.569
Lesion size (cm)	1.01 ± 2.0	0.89 ± 2.14	0.056
Number of lesions	1.91 ± 2.27	1.77 ± 2.10	0.569
Active lesions			
Active lesions (Yes)	305 (100%)	351 (99.4%)	
Active lesions (No)	0	2 (0.6%)	0.502
Therapy			
Cryotherapy	276 (90.9%)	310 (88.6%)	
Topical Glucantime	6 (2.0%)	12 (3.4%)	
Systemic	11 (3.6%)	13 (3.7%)	
Glucantime + Cryotherapy	7 (2.3%)	12 (3.4%)	0.579
Other treatments	5 (1.6%)	3 (0.9%)	
Missing data	0	3 (0.5%)	
Lesion site			
Head & Neck	55 (18.0%)	62 (17.6%)	0.261
Face	57 (16.1%)	69 (22.6%)	0.105
Hand	208 (68.2%)	230 (65.2%)	0.410
Foot	60 (19.7%)	85 (24.1%)	0.174
Body	16 (5.2%)	18 (5.1%)	0.932
Lesion type			
Acute lesions	276 (90.5%)	337 (95.5%)	0.012
Chronic lesions	16 (5.2%)	29 (8.21%)	
Underlying disease			
Underlying disease	6 (2.0%)	25 (7.1%)	0.002

Discussion

The COVID-19 pandemic has profoundly affected

multiple dimensions of public health, including the epidemiology and management of neglected tropical diseases (13). Given the extensive societal, behavioral,

and healthcare disruptions caused by the pandemic in Iran, we aimed to evaluate how these changes influenced the patterns of CL in Shiraz. By directly comparing one year before and one year after the COVID-19 outbreak, our study provides timely evidence of the indirect yet substantial impact of the pandemic on CL incidence and patient characteristics.

Our findings demonstrate a notable increase in the proportion of confirmed CL cases during the post-outbreak period (76.4%) compared with the pre-outbreak period (57.9%). This rise likely reflects behavioral shifts during the quarantine period, when many residents relocated to peri-urban and rural areas with higher sandflies density to avoid COVID-19 exposure. This interpretation is consistent with reported disruptions in vector control and environmental management programs during the pandemic, which have been described in similar studies from other regions of Iran and endemic countries.

A decrease in CL cases was found more than one year after the outbreak. Still, despite this decrease, positive cases were higher than before the outbreak, indicating that, in the COVID-19 quarantine, to escape the risk of COVID-19, some people left the city and went to towns in the upper part of the city, villages, and areas where sand flies were concentrated, and caused higher prevalence of CL. Gender distribution also changed significantly between the two periods. Before the pandemic, women constituted most CL cases, whereas after the outbreak, men represented 55.8% of cases. This shift may relate to increased workforce participation and outdoor activity among men during COVID-19 associated economic hardship, while reduced mobility among women during lockdown decreased their exposure risk. Such sex-specific behavioral changes have been documented in other infectious disease patterns during the pandemic.

The pandemic also appears to have influenced disease chronicity. Cases of chronic CL increased significantly after COVID-19, which may be attributed to delayed healthcare-seeking behaviors and reduced access to timely diagnosis during lockdowns (14-16). Similar delays in diagnosis and treatment have been reported globally for malaria (13,17), tuberculosis (18), and HIV/AIDS (19), during the pandemic, reflecting a broader pattern of service interruption. Pourfarzi *et al.*, (20) reported that the COVID-19 outbreak had a significant impact on Iran's health system, and the majority of the health budget was devoted to its control. The presence of ZCL in the same regions of Iran was likely impacted by an interrupted rodent control effort

during the COVID-19 outbreak in 2020-2021, which occurred in the four specified regions. The incidence of CL during the pandemic was further influenced by the failure of screening programs and the inaccessibility of treatment follow-up for CL patients. Also, Mazaherifar *et al.*, (21) stated that in the first year of the outbreak of COVID-19 in Jahrom City in Iran (February to December 2020), the rodent control program was completely stopped. However, from the summer of 2021 until now, the program has resumed as usual. A disrupted rodent control program and ineffective CL patient screening methods probably brought on this outbreak in Jahrom.

Underlying comorbidities, particularly diabetes and hypertension, were markedly more prevalent among CL patients in the post-outbreak period. This aligns with broader national data showing increased comorbidity burdens during the pandemic and highlights the need for integrated management strategies in vulnerable populations.

Other characteristics, including age distribution, lesion site, number of lesions, and treatment modality, remained largely unchanged between the two periods. This suggests that while patient behavior and healthcare accessibility shifted during COVID-19, the clinical presentation of CL itself remained stable.

Overall, the structured pre-/post-outbreak comparison in our study expands existing knowledge by demonstrating that pandemic-related behavioral changes, socioeconomic pressures, and health-system disruptions significantly altered CL epidemiology in Shiraz. These findings highlight the importance of maintaining vector-control programs, ensuring continuity of essential health services, and adopting adaptive surveillance strategies during widespread public health emergencies.

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