International Journal of Epidemiologic Research
doi:10.34172/ijer.2020.21 2020 Summer;7(3):120-124 http://ijer.skums.ac.ir

Original Article

# Ten-Year Trends of the Incidence of Cutaneous Leishmaniasis in the South of Fars Province, Iran, During 2007-2016

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**Abstract**

**Background and aims:** Leishmaniasis is one of the most overlooked diseases in tropical areas, which can lead to many deaths and illnesses. The present study was designed to determine the trend of cutaneous leishmaniasis in the south of Fars Province (south of Iran) during 2007-2016.

**Methods:** The population of this cross-sectional study consisted of all people with cutaneous leishmaniasis referring to the Center for Infectious Diseases in Larestan, Gerash, Evaz, and Khonj in the south of Fars Province during 2007-2016. The incidence of cutaneous leishmaniasis was analyzed using the Cochrane-Armitage trend test, and the significance level was considered 5%.

**Results:** In general, 4602 cases of cutaneous leishmaniasis were reported from 2007 to 2016. The highest and lowest incidence rates (659.1 versus 88. 3 per 100 000 people) were observed in 2008 and 2012, respectively. In addition, the incidence of the disease significantly reduced (*P* Trend = 0.003). Finally, the 0-4 age group had the highest incidence of the disease (69.64 per 100 000 people), and the hands were the most common organ affected by cutaneous leishmaniasis (37%).

**Conclusion:** According to the research findings, the incidence rate of cutaneous leishmaniasis is declining although leishmaniasis is still one of the endemic diseases in the region. Therefore, preventive and controlling interventional programs can be effective in reducing new cases of the disease, including the education of individuals, especially children, environmental cleanup, and extermination and control of stray dogs and rodents in the suburbs.

**Keywords:** Cutaneous leishmaniasis, Incidence rate, Epidemiology, Iran

Received: 9 May 2020
Accepted: 21 July 2020
ePublished: 28 September 2020

## Introduction

Today, it is known that cutaneous leishmaniasis is caused by more than 22 different species of Leishmania, the prevalence of which can vary from a region to another.[1,2] Two species of *Leishmania tropica* and *Leishmania major* in the Middle East are the most common causes of cutaneous leishmaniasis.[3] Soil mosquitoes can cause various types of leishmaniasis, including cutaneous, mucosal, or visceral leishmaniasis, by inoculating the promastigote form into the human skin.[4,5]

Leishmaniasis is endemic in many parts of the world, and this has raised health and economic concerns worldwide.[6,7] However, leishmaniasis remains one of the most overlooked diseases in tropical areas that can lead to many deaths and illnesses.[8] In addition, the disease affects most poor people and is associated with malnutrition, unsafe housing, poor immune systems, and population displacement.[6,9] Some studies have also reported an increase in the prevalence of this disease due to various factors such as environmental conditions, socio-economic status, demographic features, and human behaviors.[7,10] The World Health Organization (WHO) reported that 350 million people worldwide are at the risk for infection,[11,12] and about 2 million people are diagnosed with leishmaniasis each year.[12] The cutaneous and visceral form of leishmaniasis has been mainly reported in 14 countries in the Eastern Mediterranean region,[13] including Iran.[14] There are two forms of cutaneous leishmaniasis in Iran, including anthroponotic and zoonotic cutaneous leishmaniasis, which are known as urban (dry) and rural (wet) types, respectively. Further, this disease is endemic in 17 out of 31 provinces of Iran,[15] and its lifetime prevalence varies from 1.8% to 37.9%.[16] Cutaneous leishmaniasis is also an endemic disease in the Middle East and North Africa and affects countries such as Jordan, Libya, Egypt, Tunisia, Sudan, and Palestine in terms of rural leishmaniasis and Iran, Syria, Saudi Arabia, and Iraq in both rural and urban areas.[13,17] On the other hand, according to the WHO, more than 70% of cutaneous leishmaniasis has been observed in Iran, Algeria, Afghanistan, Colombia, Brazil, Sudan, Ethiopia,

Syria, and Peru.[16] Given that leishmaniasis parasitic diseases have placed a heavy burden on the human and community health and are less attended compared to other tropical diseases such as malaria, tuberculosis, and AIDS,[18] the present study aimed to determine the incidence of cutaneous leishmaniasis in southern Iran from 2007 to 2016.

## Materials and Methods

The population of this cross-sectional study included all people with cutaneous leishmaniasis referring to the Center for Infectious Diseases in Larestan, Gerash, Evaz, and Khonj in the south of Fars Province, southern Iran, from 2007 to 2016.

### *Study Area*

The Larestan and Gerash region with an area of approximately 21 000 km$^2$ is located in the south of Fars Province and southwestern Iran. In terms of climate, it is a dry region with an average annual rainfall of about 151.8 in the period from 2003 to 2010 [19]. According to the 2016 Population and Housing Census in Iran, the total population of Larestan, Gerash, Khonj, and Evaz was estimated at 309,186 [20].

The present study was the result of a research project No. 1397-030 and the code of ethics of IR.LARUMS.REC.1398.015. To collect the data, a checklist was used that included information such as the number of cases of the disease for each year, age, gender, damaged organ, and type of cutaneous leishmaniasis (urban or rural).

After completing the checklists that contained information about four cities in the south of Fars Province, the data were entered into SPSS software, version 25 and Excel 2013. It should be noted that information about patients remained confidential at all stages of completing the checklist and data entry into the software.

### *Data Analysis*

The descriptive statistics of variables were showed by tables and graphs. To calculate the incidence rate, the average population of the year, and the number of new cases of the disease were used each year. Finally, the incidence of leishmaniasis was analyzed using the Cochrane-Armitage trend test, and the significance level was considered 0.05.

## Results

Overall, 4602 cases of cutaneous leishmaniasis were observed in the southern region of Fars from 2007 to 2016, of which 51.44% were women. In addition, 76.29% of these patients had only one wound on their organs, and the highest frequency was reported in the hands (37%) and face (22.88%), respectively. Of the 3,258 registered cases of cutaneous leishmaniasis, most were urban or dry (Table 1). Furthermore, the linear diagram and test of the Cochrane-Armitage process were used to show the trend of cutaneous leishmaniasis in this area. The results of Figure 1 showed the highest (659.1 cases per 100 000 population) and lowest (88.3 per 100 000 population) incidence rates in 2008 and 2012, respectively. A review of the disease during 2007-2016 demonstrated a significantly decreasing trend (*P* Trend = 0.003).

**Table 1.** Comparison of the Frequency (%) of the Qualitative Characteristics of People With Leishmaniasis (2007-2016)

| Variable | Frequency | Percent |
|---|---|---|
| Gender | | |
| Male | 2235 | 48.56 |
| Female | 2367 | 51.44 |
| Organ<br>One organ | | |
| Face | 1053 | 22.88 |
| Hands | 1703 | 37.00 |
| Foot | 667 | 14.50 |
| Other | 88 | 1.91 |
| Multi organ | 1091 | 23.71 |
| Leishman type | | |
| Urban | 1966 | 42.72 |
| Rural | 1292 | 28.07 |
| Missing data | 1344 | 29.20 |

Figure 2 displays the incidence rate of cutaneous leishmaniasis by age. Based on the results, the highest incidence rate was related to the 0-4 age group (69.64 cases per 100 000 population), and the age groups were 5-9, 10-14, and more than 50 years, respectively. The incidence of the disease also decreased with age (*P* Trend = 0.002). However, the number of new cases of the disease in the age group of 50 years and older increased in comparison with the age group of 45-49 years.

## Discussion

Leishmaniasis has been reported as a native disease of Fars province area, especially in Larestan, and a significant number of people are exposed to this parasitic disease each year.[21] The results of the present study revealed that a total of 4602 cases of cutaneous leishmaniasis was reported in Larestan in 2007-2016. Moreover, the highest and lowest incidence rates with 659.1 and 88.3 cases per 100 000 population were observed in 2008 and 2012, respectively, and the incidence rate of the disease decreased significantly during 2007-2016.

The findings of a study by Athari and Jalallou showed that the incidence rate of cutaneous leishmaniasis was 30 cases per 100 000 population in 2006. It was further found that the highest number of cases was related to Khorasan, Isfahan, and Fars provinces [22].

Based on the results of another study by Holakouie-Naieni et al conducted during 1983-2013, the incidence of skin leishmaniasis was 30.9 per 100 000 population in Iran during the above period [23].

The most important reasons for the decrease in cases

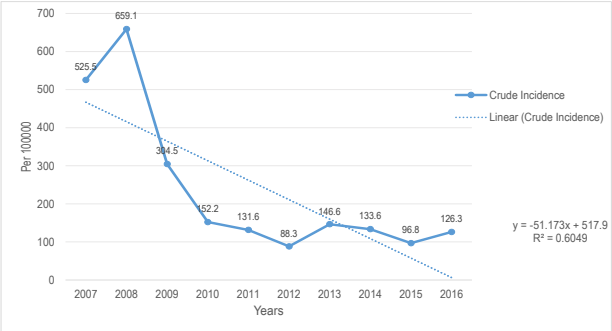


**Figure 1.** Time Trend of Cutaneous Leishmaniasis Incidence by Year Per 100 000 People in Southern Fars Province (2007-2016).

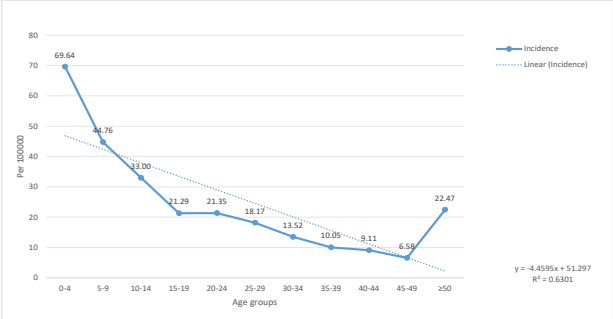


**Figure 2.** Incidence Rate of Cutaneous Leishmaniasis in 100 000 People in 5-Year Age Groups in Southern Fars Province (2007-2016).

of leishmaniasis in this area during 2007-2016 were the preventive measures of the health centers of the city. Such measures included increasing public awareness, especially about the ways of transmitting the disease, combating mosquitoes carrying the disease by spraying residential houses, especially in the suburbs and the places where livestock and poultry are kept, and finally, struggling and controlling the rodents and stray dogs in the area.[24]

Likewise, Piroozi et al found that the incidence rate of leishmaniasis in Iran varied from 50 to 250 cases per 100 000 population, and the highest incidence rate of leishmaniasis with 252.92 cases per 100 000 population was observed in 1984. Additionally, the incidence rate of leishmaniasis was 185.50 and 124.40 per 100 000 population in 2007 and 2015, respectively.[25]

The findings of a similar study in the Province of Hamadan in western Iran (2007-2016) showed that a total of 908 cases of leishmaniasis (the maximum and minimum incidence rates with 12.6 and 1.5 per 100 000 population were related to 2015 and 2008, respectively) was detected and observed in this region, which was extremely small compared to the present study.[14] Using the polymerase chain reaction diagnostic method, Hussain et al reported that the prevalence rate of cutaneous leishmaniasis in war-torn areas was about 3.61%.[26] However, a study in Peshawar, Pakistan, showed that the prevalence rate of leishmaniasis in urban areas was around 87%.[27]

The results of the present study represented that women were more likely to have leishmaniasis compared to men, which contradicts the findings of some studies[25,28] while in agreement with those of Ibarra-Meneses et al in Spain.[8] It seems that women further refer to health systems for health care and are more likely to be diagnosed with the disease. Based on the findings of another study in southeastern Iran, the incidence rate of the disease in men and women was 114 and 90 cases per 100 000 population, respectively.[29]

Regarding the age groups, the results of the Cochrane-Armitage trend test in the present study demonstrated that the highest incidence rate of cutaneous leishmaniasis was in the age groups of 0-4 and 5-9 years, respectively, which is in line with the results of Moghateli et al and Jorjani et al.[16,29] However, another study in Iran reported that the highest number of cases was related to the age group of 20-29 years while the lowest number belonged to the age groups of 70-79 and 0-9 years, which is in contrast with the findings of the present study.[14] Children are more prone to the disease because they are less likely to maintain personal hygiene and thus are more susceptible.

The results of the present study further revealed that the majority of patients had only one organ involved in leishmaniasis wound, and the hands and face were the most common body organs that were involved in leishmaniasis, which is consistent with that of the study carried out by Pagheh et al.[24] Another study reported that the majority of patients had more than two organs involved with leishmaniasis wound.[30] Accordingly, hands are more prone to biting mosquitoes in comparison with other organs since this region has a warm climate most days of the year and thus people wear short-sleeved or sleeveless clothes.

The major limitation of the present study was large number of missing data. Data on many variables such as reservoir type, occupation, and nationality, as well as the type of diagnosis, history of travel to endemic areas, and history of co-occurrence in the family were excluded from the study analysis.

## Conclusion

In general, the incidence rate of cutaneous leishmaniasis represents a decline in Larestan. The highest and lowest numbers of new cases were observed in 2008 and 2012, respectively. It should be mentioned that the incidence rate of the disease varies from 659.1 to 88.3 per 100 000 population. Despite the declining incidence of cutaneous leishmaniasis in this area, it is still considered as an endemic disease. Thus, preventive interventions and controls including educating individuals, especially children, cleaning up the environment, and exterminating and controlling stray dogs and suburban rodents can be effective in reducing new cases of the disease. On the other hand, creating an appropriate structure for the accurate and online registration of cases and information related to the disease in preparing weekly, monthly, and yearly reports will greatly contribute to the diagnosis, prevention, and control of leishmaniasis.

## Conflicts of Interest Disclosure

The authors declare no conflicts of interest.

## Ethical Approval

The present project was approved by the Ethics Committee of Larestan University of Medical Sciences (ID number= IR.LARUMS.REC.1398.015).

## Acknowledgments

The present study is the result of a research project with the code number of 1397-030 in Larestan University of Medical Sciences. We would like to appreciate Larestan University of Medical Sciences for providing financial support for this project.

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