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# Trend, Incidence, Distribution, and Other Epidemiological Aspects of Cutaneous Leishmaniasis in Ilam Province-Iran From 2014 to 2017

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## ABSTRACT

This study was conducted to evaluate the incidence rate as well as demographic and clinical characteristics of Cutaneous Leishmaniasis (CL) cases from 2014 to 2017 in Ilam province. In this registry-based descriptive study, the information from 4697 treated patients, who were diagnosed with CL from 2014 to 2017 in Ilam province and enrolled in this study, was used. Data were analyzed using SPSS software version 22. The incidence rate of CL in the years of 2014, 2015, 2016, and 2017 was 269.6, 244.4, 182.7 and 133.4 per 100,000, respectively, that indicating a downward trend in the rate of disease ( $p < 0.001$ ). Mehran and Dehloran counties had highest incidence rate (1208.1 and 227.3 per 100,000, respectively). The results of the present study indicating the high incidence rate of CL in Ilam province.

**Keywords:** Cutaneous leishmaniasis, incidence, epidemiology, Ilam

## INTRODUCTION

According to the World Health Organization (WHO) reports, Leishmaniasis has become endemic in 88 countries (66 countries in Asia and Africa and four countries in Europe and the US (1, 2) and, also more than 70% of new cases have been reported from Afghanistan, Algeria, Colombia, Brazil, Iran, Syria, Ethiopia, North Sudan, Costa Rica and Peru (3).

The prevalence of Leishmaniasis in Iran is increasing, and annually, the cases of the disease are reported from different parts of the country; main focal regions of wet-type leishmaniasis involve villages of Isfahan, Khuzestan, Ilam, and northeast of Iran while main focal regions of dry-type leishmaniasis involve some big and small cities, such as Mashhad, Tehran, Shiraz, Kerman, Bam, Yazd, and Neyshabur (4, 5). According to official reports from the Ministry of Health and Medical Education, the average incidence rate of CL is usually between 20 to 40 per 100,000 populations, and average more than 150 cases per 100,000 population was reported in endemic areas, including Yazd, Semnan, Fars, Ilam, Khuzestan and Isfahan (6).

In recent years, Ilam province can see the upward trend in the incidence of disease, especially in the southern areas of the province (7); As CL is a serious health problem in Iran, conducting epidemiological studies to define control interventions has become increasingly important. Therefore, since the high incidence of CL in Ilam, the current study was conducted to examine the epidemiological aspects of CL from the years 2014 to 2017 in Ilam province.

## MATERIALS and METHODS

### Research Setting

Ilam province, as one of the endemic centers of CL, with an estimated population of 600,000, is located in southwestern Iran (Fig. 1).

### Study Design and Data Collection

In the present registry-based cross-sectional study, all patients with CL who were diagnosed and treated in health centers affiliated to the Ilam University of Medical Sciences from January 2014 to December 2017 were included. In this study, the main included variables were diagnosis year, sex, place of residence (town or village), county of residence, and type of Leishmaniasis. Data were collected using a checklist extracted from the medical records of treated patients. Duplicate cases, incomplete cases, and cases without physician approval were excluded from this study.

### Statistical Analysis

Statistical analysis of data was carried out using SPSS software version 22. The incidence rate of the disease was calculated for different counties distinctly in 100,000 populations of Ilam province, based on year and sex, and to describe data, tables and graphs. The significance level was considered less than 0.05.

### Cite this article as:

Jorvand R, Chatripour R, Jaliliyan A, Khazaei S, Veisani Y. Trend, Incidence, Distribution, and Other Epidemiological Aspects of Cutaneous Leishmaniasis in Ilam Province-Iran From 2014 to 2017. Erciyas Med J 2020; 42(3): 329-32.

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Submitted  
14.12.2019

Accepted  
09.03.2020

Available Online Date  
17.06.2020

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**Table 1.** incidence rate of Leishmania by gender in Ilam province between 2014 to 2017

| Gender | Year | Country-side's          |       |        |      |            |      |          |      |        |      |       |      | Total      |      |        |      |                   |      |        |      |       |      |       |
|--------|------|-------------------------|-------|--------|------|------------|------|----------|------|--------|------|-------|------|------------|------|--------|------|-------------------|------|--------|------|-------|------|-------|
|        |      | Abdanan                 |       | Badreh |      | Dare Shahr |      | Dehloran |      | Eyvan  |      | Ilam  |      | Malekshahi |      | Mehran |      | Shirvan Chardavol |      | Sirvan |      |       |      |       |
|        |      | N                       | Rate* | N      | Rate | N          | Rate | N        | Rate | N      | Rate | N     | Rate | N          | Rate | N      | Rate | N                 | Rate | N      | Rate | N     | Rate |       |
| Male   | Year | 2014                    | 30    | 123.1  | 0    | -          | 22   | 94.3     | 397  | 1165.3 | 61   | 245.3 | 77   | 64.1       | 10   | 94.8   | 331  | 2162.1            | 25   | 85.1   | 1    | 13.6  | 954  | 322.1 |
|        |      | 2015                    | 107   | 439.3  | 2    | 25.8       | 33   | 147.9    | 230  | 675.1  | 33   | 132.7 | 90   | 75.2       | 28   | 265.4  | 212  | 1385.2            | 28   | 95.3   | 0    | -     | 763  | 258.4 |
|        |      | 2016                    | 12    | 49.2   | 5    | 64.5       | 13   | 58.2     | 121  | 355.1  | 34   | 136.7 | 95   | 79.3       | 19   | 180.1  | 358  | 2338.9            | 9    | 30.6   | 0    | -     | 666  | 233.5 |
|        |      | 2017                    | 17    | 69.8   | 3    | 38.7       | 13   | 58.1     | 123  | 361.0  | 57   | 229.2 | 35   | 29.8       | 23   | 218.0  | 210  | 1372.0            | 16   | 54.4   | 1    | 13.2  | 498  | 168.6 |
|        |      | 2014                    | 13    | 55.3   | 0    | -          | 7    | 32.7     | 286  | 906.1  | 10   | 40.6  | 20   | 17.3       | 8    | 75.5   | 258  | 1780.4            | 5    | 17.8   | 0    | -     | 607  | 213.2 |
| 2015   | 77   | 327.6                   | 0     | -      | 31   | 144.8      | 180  | 570.3    | 13   | 52.7   | 42   | 36.6  | 16   | 151.0      | 170  | 1173.1 | 9    | 32.1              | 1    | 14.1   | 539  | 189.1 |      |       |
| 2016   | 9    | 38.2                    | 1     | 12.7   | 0    | -          | 85   | 269.3    | 11   | 44.6   | 53   | 44.5  | 10   | 94.4       | 222  | 1531.9 | 3    | 10.7              | 0    | -      | 394  | 138.1 |      |       |
| 2017   | 9    | 37.9                    | 0     | -      | 2    | 9.3        | 59   | 186.9    | 27   | 109.6  | 21   | 18.1  | 6    | 56.6       | 150  | 1035.1 | 2    | 7.1               | 0    | -      | 276  | 96.8  |      |       |
| Female | Year | 2014                    | 43    | 89.8   | 0    | -          | 29   | 66.3     | 683  | 1040.6 | 71   | 143.4 | 97   | 41.2       | 18   | 85.1   | 589  | 1976.6            | 30   | 52.2   | 1    | 6.9   | 1561 | 269.6 |
|        |      | 2015                    | 184   | 384.5  | 2    | 12.8       | 64   | 146.2    | 410  | 624.7  | 46   | 92.9  | 132  | 56.1       | 44   | 208.1  | 382  | 1282.0            | 37   | 64.4   | 1    | 6.7   | 1302 | 244.4 |
|        |      | 2016                    | 21    | 43.8   | 6    | 38.4       | 13   | 29.7     | 206  | 313.8  | 45   | 90.9  | 148  | 62.9       | 29   | 137.9  | 580  | 1946.5            | 12   | 20.9   | 0    | -     | 1060 | 182.7 |
|        |      | 2017                    | 26    | 54.3   | 3    | 19.2       | 15   | 34.3     | 182  | 277.3  | 84   | 169.7 | 56   | 23.8       | 29   | 136.8  | 360  | 1208.1            | 18   | 31.3   | 1    | 6.5   | 774  | 133.4 |
|        |      | 2014                    | 43    | 89.8   | 0    | -          | 29   | 66.3     | 683  | 1040.6 | 71   | 143.4 | 97   | 41.2       | 18   | 85.1   | 589  | 1976.6            | 30   | 52.2   | 1    | 6.9   | 1561 | 269.6 |
| 2015   | 184  | 384.5                   | 2     | 12.8   | 64   | 146.2      | 410  | 624.7    | 46   | 92.9   | 132  | 56.1  | 44   | 208.1      | 382  | 1282.0 | 37   | 64.4              | 1    | 6.7    | 1302 | 244.4 |      |       |
| 2016   | 21   | 43.8                    | 6     | 38.4   | 13   | 29.7       | 206  | 313.8    | 45   | 90.9   | 148  | 62.9  | 29   | 137.9      | 580  | 1946.5 | 12   | 20.9              | 0    | -      | 1060 | 182.7 |      |       |
| 2017   | 26   | 54.3                    | 3     | 19.2   | 15   | 34.3       | 182  | 277.3    | 84   | 169.7  | 56   | 23.8  | 29   | 136.8      | 360  | 1208.1 | 18   | 31.3              | 1    | 6.5    | 774  | 133.4 |      |       |
|        |      | *per 100,000 population |       |        |      |            |      |          |      |        |      |       |      |            |      |        |      |                   |      |        |      |       |      |       |

## RESULTS

The incidence rates of CL per 100,000 people in the 10 countryside were shown in both genders in Table 1. The incidence rates for 2014–2017 were 322.1, 258.1, 233.5, and 168.6 per 100,000 for males and 213.2, 189.1, 138.1, and 96.8 per 100,000 for females. According to this, the highest incidence rate was in 2014 for both genders. Among the 10 countryside's in Ilam province, Malekshahi and Mehran had the highest incidence rate, the incidence rate in Mehran was 1976.6, 1282.0, 1946.5, and 1208.1 during 2014–2017, respectively. The total incidence rates were 269.6, 244.6, 182.7, and 133.4 per 100,000 populations from 2014 to 2017. Also, we found that *L. major* was more prevalent than *L. tropica* in all ages in the Ilam province in the study period (Fig. 2).

We compared the incidence rate in females and males over the study period, and according to our results, the incidence rate was statistically decreasing in both genders. Thus, in 2017, it has reached its lowest level (Fig. 3).

## DISCUSSION

The results of this study showed that the highest incidence of CL in Ilam province occurred in 2014 (269.6 per 100,000 populations), and the number of infected cases gradually decreased to 133.4 per 100,000 populations in 2017. The downward was shown in previous studies (4, 6). The downward trend possibly will be due to interventional measures, such as rodent elimination, general education, or reduction of the population susceptible to Leishmaniasis.

Another notable finding in this study was that, in 2014, we had an outbreak of CL in some counties of Ilam province. The incidence rate of CL in Mehran and Dehloran counties were 2162.1 and 1165.3 per 100,000, respectively, which is 20–50 times higher than the national average (8). The high incidence rate of CL depends on a variety of factors, including climate change, natural disasters, war, marginalization, excessive wastes of building construction, inadequate environmental improvements and inadequate control measures. The results of this study indicate a high incidence of the disease, especially in 2014. From 2011 to 2014, a series of earthquakes occurred in the Ilam province, with the maximum number of earthquakes occurring between 2013 to 2014 (9). This paved the way for the transfer of rodents to cities and villages and created an environment conducive to the vector propagation. Furthermore, due to fear of earthquakes, people left out of their homes, especially at night, which is pick time of being bitten by flies, and this may have been associated with an increased incidence of the disease.

## CONCLUSION

The results of this study showed a high incidence rate of CL in Ilam province, especially in 2014. Therefore, preventive interventions, such as environmental improvement, raising awareness of the undercover population, controlling the carrier and disease reservoir, as well as considering their role in the disease control and preventing its spread to other areas is recommended.



Figure 1. Geographic location of the Ilam province in the Iran

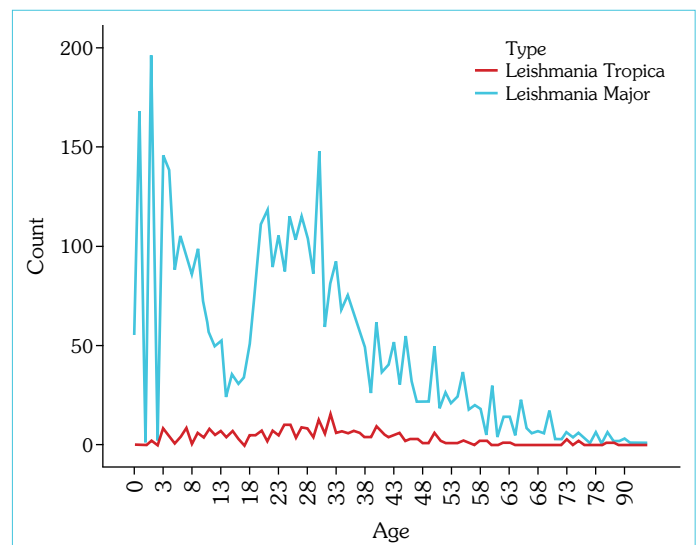


Figure 2. The distribution of cutaneous leishmania type according to age for both types; *L. tropica* and *L. major*



Figure 3. Trend of the incidence rate of cutaneous leishmania in the Ilam province, 2014 to 2017, by gender

**Acknowledgements:** The authors would like to thank the CDC in the Health Department of the Ilam University of Medical Sciences for their cooperation.

**Ethics Committee Approval:** Ethics approval for this study was given by the Ethics Committee of the Ilam University of Medical Sciences on 15 October 2016 under the Reference Code ir.medilam.rec.1395.93.

**Informed Consent:** Written informed consent was obtained from patients who participated in this study.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept – RJ, YV; Design – YV, AJ; Data Collection and/or Processing – RJ, RC, SK; Analysis and/or Interpretation – YV, RJ; Literature Search – YV; Writing – SK, RJ; Critical Reviews – RJ, RC, AJ, SK, YV.

**Conflict of Interest:** The authors have no conflict of interest to declare.

**Financial Disclosure:** We thank our colleagues from Ilam University of Medical Sciences that sponsored this project financially.

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