

## Epidemiological survey and geographical distribution of cutaneous Leishmaniasis in North Khorasan province, 2006-2013

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### ABSTRACT

**Background and aims:** Leishmaniasis is a widespread problem, especially in the tropical and subtropical countries. Since understanding the epidemiologic and geographical distribution of the diseases is necessary for prevention and controlling the Leishmaniasis. This study was conducted on epidemiological survey of cutaneous Leishmaniasis in North Khorasan Province, using Arc GIS Software during the years 2006-2013.

**Methods:** In this cross-sectional study, data of the Leishmaniasis patients between the years 2006-2013 were collected from the different districts of North Khorasan Province. The gathered data were analyzed by using SPSS16 statistical software and chi-square test.

**Results:** Data concerning 2831 patients with Cutaneous Leishmaniasis were collected. The maximum outbreak of the disease occurred in 2011 and the minimum occurrence was reported in 2008. The mean age of the study population was  $22.80 \pm 18.08$  and the maximum cases of infection were observed in age group of 16-30 years. 58.6% of the patients were male and 53.5% of them lived in the villages. The maximum infection of the disease was observed in Esfarayen with 1095 people (38.7%). There was a significant relationship between the gender and age of the patients and cutaneous Leishmaniasis ( $P < 0.001$ ).

**Conclusion:** In this province, Leishmaniasis is more epidemic among men of 16-30 years of age, villagers and laborers. These factors have to be necessarily considered in prevention and controlling programs.

**Keywords:** Cutaneous Leishmaniasis, Epidemiology, Geographical Distribution.

### INTRODUCTION

Leishmaniasis is one of the serious diseases transmitted by phlebotomus sand flies, subfamily of Phlebotominae.<sup>1</sup> It is a disease caused by protozoan parasites of the genus *Leishmania*. It is classified as zoonosis diseases.<sup>2</sup> Cutaneous Leishmaniasis is the most common form of this disease that causes ulcers on the skin, the sign of which remains on human skin for life. The clinical and

epidemiological forms of the disease are different depending on the counter effect of various factors, parasites, hosts, vectors, and environments.<sup>3-6</sup> From among three clinical forms (cutaneous, visceral and mucocutaneous) cutaneous is of the highest frequency in the world.<sup>7</sup> The Leishmaniasis diagnosis code in ICD 10 is B55.9<sup>8</sup> and according to WHO report, cutaneous Leishmaniasis is still of the

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healthcare problems in the world, particularly in tropical and subtropical countries.<sup>9,10</sup> The spread of cutaneous Leishmaniasis in Iran is high, so that Iran is among the first 6 countries in the world challenging with the disease. An annual around 30000 people are reported to catch cutaneous Leishmaniasis in Iran.<sup>11,12</sup> Based on research, the real figure is 4-5 times more than reported data.<sup>13</sup> Leishmaniasis is endemic in 98 countries of the world and 350 million people are subjected to the infection by the disease. It is estimated that 14 million people have already inflicted with the disease and almost 95% of the disease occurs in the United States, Mediterranean area, Middle East and Central Asia. Over two-third of new cutaneous Leishmaniasis occurs in six countries including Afghanistan, Algiers, Brazil, Columbia, Islamic Republic of Iran and Syria.<sup>14</sup> The disease is endemic to the majority of provinces in Iran.<sup>15</sup> Cutaneous and visceral Leishmaniasis are among the important parasitic diseases in Iran. Both urban and rural cutaneous Leishmaniasis are common in Iran. The rural cutaneous Leishmaniasis with wet ulcers is most common in the provinces of Isfahan, southern Fars Province, North Khorasan, South Khorasan, Khorasan Razavi, Mazandaran, Khuzestan, Ilam, Bushehr, Hormozgan and Semnan, while urban cutaneous Leishmaniasis with dry ulcers is most common in the provinces of Tehran, Khorasan Razavi, Yazd, Fars and Kerman.<sup>16</sup> Due to long period of injury, the disease leaves bad scar on face, and there is possibility of recurrence and thus imposes heavy cost on the society and on the patients after using various medicines and suffering their side effects.<sup>17,18</sup> Cutaneous Leishmaniasis in Iran is on the rise and it has laid a heavy burden of healthcare and economic problems on the society. Since there is no effective vaccine against this disease, it has absorbed a huge budget from the Ministry of Health.<sup>19</sup> In a study, carried out in Marvdasht, Fars Province, on 2627 patients,

1337 and 1290 patients had caught the disease in 2008 and 2009, respectively. The occurrence of the disease in men was 60.3%, and in fall 53.8% and in the age group of 15-30 (40%) above the other groups and the majority of the people living in the cities (57.5%), lived mostly in the newly constructed buildings (72%).<sup>20</sup> In the past, the centers for the spread of cutaneous Leishmaniasis were quite known, but with the population growth, expansion of the cities, and construction of the residential areas close to the habitat of the rodents (resources of the disease) and establishment of the towns have brought about development of this disease so that over half of the provinces in Iran challenge this problem, including North Khorasan Province. North Khorasan Province is located in northeast of Iran and some cities like Jajarm and Esfarayen are among the recognized centers of cutaneous Leishmaniasis. Since epidemiological and geographical factors are very important in prevention and controlling of the disease, this study has focused on the factors that can help to prevent and control the cutaneous Leishmaniasis, and helping for identification of the patients in order to promote and concentrate the controlling activities and presenting data to the authorities in charge.

## METHODS

In this descriptive-analytical (cross-sectional) study, the Leishmaniasis patients referring to health and medical centers in North Khorasan province, whose infection to Leishmaniasis had been diagnosed in between the years 2006-2013 in clinical and laboratory procedures had been approved, were epidemiologically studied. The sampling in this study was based on census from among all patients suffering from the disease in eight years. The data on patients during the noted years was extracted from

their files and all patients were included in the study. During the past 8 years, 2831 patients were identified in the cities of North Khorasan province. All rules of ethics were observed in connection with the patients. Their names and family names were deleted and their specifications were presented in groups. The registration of data was carried out in the health and medical centers and there was no obligation to do. The required data on each patient, i.e. age, gender, residence (city, village), month and season of disease outbreak, number of ulcers, and ulcer zone were recorded in the related checklist (Table 1) and in the end, the data were analysed by SPSS statistical software and chi-square statistical hypothesis test. Also, GIS software was used to show the geographical distribution on the map.

**Table 1:** Month distribution of cutaneous Leishmaniasis in North Khorasan province in Iran, 2006-2013

| Month | Frequency |         |
|-------|-----------|---------|
|       | Number    | Percent |
| Mar   | 42        | 1.5     |
| Apr   | 48        | 1.7     |
| May   | 61        | 2.2     |
| Jun   | 51        | 1.8     |
| Jul   | 108       | 3.8     |
| Aug   | 348       | 12.3    |
| Sep   | 825       | 29.1    |
| Oct   | 817       | 28.9    |
| Nov   | 342       | 12.1    |
| Dec   | 108       | 3.8     |
| Jan   | 46        | 1.6     |
| Feb   | 35        | 1.2     |
| Sum   | 2831      | 100.0   |

## RESULTS

In this study, 2831 patients of cutaneous Leishmaniasis patients living in North Khorasan province were reviewed. The mean age of the subjects of this study was

22/80 ± 18/08 and the maximum cases of infection were observed in age group of 16-30 years and minimum infection was observed in patients with 61 years of age and above (Table 2).

**Table 2:** Frequency of cutaneous Leishmaniasis by age and season of diagnosis in North Khorasan province in Iran, 2006-2013

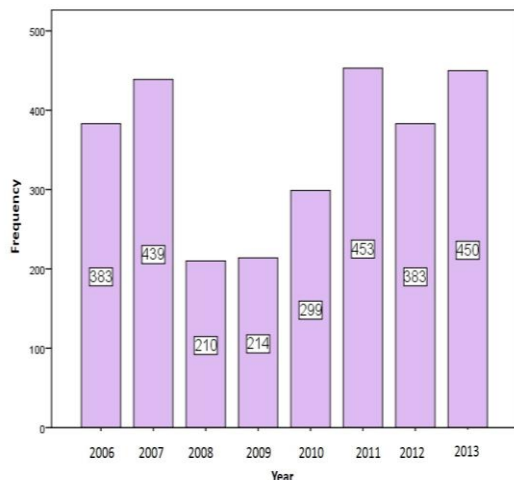
| Variable    | Frequency |         | P       |         |
|-------------|-----------|---------|---------|---------|
|             | Number    | Percent |         |         |
| 0-5 years   | 556       | 19.6    | P<0.001 |         |
| 6-15 years  | 616       | 21.7    |         |         |
| 16-30 years | 766       | 27.1    |         |         |
| 31-45 years | 537       | 19.0    |         |         |
| 45-60 years | 260       | 9.2     |         |         |
| +61 years   | 96        | 3.4     |         |         |
| Sum         | 2831      | 100     |         |         |
| Season      | Spring    | 151     | 5.33    | P<0.001 |
|             | Summer    | 507     | 18      |         |
|             | Autumn    | 1984    | 70      |         |
|             | Winter    | 189     | 6.67    |         |
|             | Sum       | 2831    | 100     |         |

The cutaneous Leishmaniasis spread in the districts of the province was like the following: Bojnurd 385 patients (13.6%), Esfarayen 1095 patients (38.7%), Farouj 51 patients (1.8%), Garmeh 104 patients (3.7%), Jajarm 994 patients (35.1%), Maneh and Samalqan 59 patients (2.1%), Shirvan 142 patients (5.0%). The students constituted 20.1 percent of the patients of cutaneous Leishmaniasis and among various occupations; the laborers with 9.5% maintained the maximum level. Some 40% of the patients had a single ulcer on their skin created by the bite of sand flies and the maximum (38.7) bite zone was on the hand (Table 3).

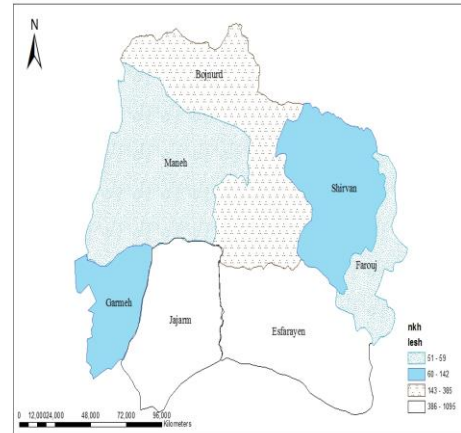
**Table 3:** Frequency of cutaneous Leishmaniasis by Number and location of lesions in North Khorasan Province, Iran: 2006-2013

| Variable            | Frequency     |         |      |
|---------------------|---------------|---------|------|
|                     | Number        | Percent |      |
| Number of lesions   | One           | 1133    | 40   |
|                     | Two           | 738     | 26.1 |
|                     | Three         | 224     | 7.9  |
|                     | Four and more | 736     | 26   |
|                     | Sum           | 2831    | 100  |
| location of lesions | Face          | 899     | 31.8 |
|                     | Hand          | 1097    | 38.7 |
|                     | Foot          | 690     | 24.4 |
|                     | Other         | 880     | 31.1 |
|                     | Sum           | 2831    | 100  |

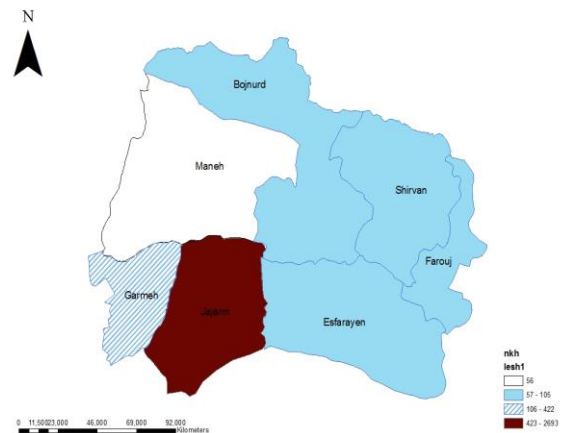
There was no significant relationship between the residence (city, village), month and season of catching the disease, number of ulcers, and ulcer zone. Figure 2 depicts a GIS map of the reported cutaneous Leishmaniasis in North Khorasan province during the years 2006-2013 and Figure 3 depicts a GIS map of prevalence of cutaneous Leishmaniasis in North Khorasan province during the years 2006-2013.



**Figure 1:** Frequency of cutaneous Leishmaniasis by year of diagnosis in North Khorasan province in Iran, 2006-2013



**Figure 2:** Distribution cutaneous Leishmaniasis in different districts of North Khorasan province in Iran, 2006-2013



**Figure 3:** Prevalence (per 10000) cutaneous Leishmaniasis in different districts of North Khorasan province in Iran, 2006-2013

## DISCUSSION

Cutaneous Leishmaniasis is one of the endemic diseases to the majority countries of the world, including Iran. Various studies have been conducted across the world, including Iran, on diversified aspects of the disease including the epidemiological aspects with an emphasis on descriptive epidemiology of age, gender, occupation, etc. with similar and chiefly different results. In the present paper, that was carried out in sectoral (descriptive-

analytical) method, we have tried to use available data and statistics on population, to study the status of cutaneous Leishmaniasis disease in terms of some epidemiological aspects among 2831 approved patients during the eight years. In carrying out this study, there are some limitations that must be taken into consideration. First, it was used the data available at the medical and healthcare centers and some patients have been treated outside the province. Second, some patients may have been treated without medication and have not been registered in the medical centers. They may have been outnumbered in this study. According to studies, the number of these patients is limited. In terms of gender, male patients constituted the majority of patients with 58.6%. The finding is compatible with the findings in Marvdasht of Fars province, Shiraz, Kerman, Sabzevar and Pakistan. In studying the Marvdasht, Fars, the percentage of male patients stood at 3.60%.<sup>20</sup> In another study in 2008 in Shiraz the male percentage stood at 59.36% against 40.64%.<sup>21</sup> In Kerman, male patients percentage stood at 56%,<sup>22</sup> and in Pakistan 65.6% of the patients were men.<sup>23</sup> In another study in the rural schools of Jowayn and Sabzevar, the disease outbreak in boys was over two-fold girls.<sup>24</sup> One of the reasons for the conformity of the data is because of the Hijab worn by women in Muslim countries. Another reason is this that usually men are active outside the house and they are more in contact with the parasitic disease. Another important factor in catching the infectious diseases like cutaneous Leishmaniasis is the age of the patient. In this study, the mean age of the individuals was  $22/80 \pm 18/08$  and maximum outbreak of the disease was observed in age group of 16-30. In Marvdasht study, the average age of the patients was  $16/9 \pm 30/7$  and the maximum outbreak was in the age group of 15-30 years (40%).<sup>20</sup> This is indeed the same active age group of the statistical society who are exposed to the disease for activity beside the parasite colony,

rodents, insects, etc. As a rule, the adults living in non-endemic regions close to the centers of infection are more exposed to catching the disease.<sup>23</sup> In a study, 51.1% of the patients are in the age group of 6-15 years and in another study the majority of patients are in age group of 16-50, and finally 85% of the patients were the youth and adults.<sup>7,25,26</sup> In this study, the majority of the ulcers were on hands (38.7%), while in Marvdasht study the majority of the ulcers appeared in upper part of the body (52.1%).<sup>20</sup> It is clear that the uncovered body parts are more exposed to sandflies bite. In some other studies, the majority of the ulcers appeared in the upper part of the body. In Bam and Kerman the ulcers appeared on neck and face (6.63%), head and face (56%) and hand (65.8%). The findings of this study conform to the previous studies.<sup>22,27</sup> This shows abundance of bites and frequency of sandflies in these regions. In a study carried out in Kashan, the majority of ulcers were reported to be on hands, feet and then on face respectively.<sup>15</sup> The majority of the patients had two or more ulcers that are compatible with the other studies.<sup>20,23,28</sup> In terms of the season, the maximum occurrence has been reported in fall and then summer that is conforming to Marvdasht study.<sup>20</sup> This is justifiable with respect to the biology of the sandflies in the region, a subfamily Phlebotominae as one of the major vectors or transmitters. In the meantime, the majority of the occurrence of the disease was in August and similar result has been in Marvdasht.<sup>20</sup> Whereas in the study in Pakistan,<sup>23</sup> the majority of the outbreak has been in winter. Although the majority of the occasions in summer and fall are compatible with the rural cutaneous Leishmaniasis characteristics, the occurrence of the disease in March is not conforming to this pattern that can be because of the delay in diagnosis of the disease. And that the type of the disease is not rural, so that urban Leishmaniasis may be also at work in the province. Despite the fact that in the

previous study Jajarm had the highest degree of infection with rural cutaneous Leishmaniasis, according to the results of this study, Esfarayen has the highest rate. This is because of separation of Garmeh from Jajarm that has reduced the population of the city and accordingly the number of the patients in comparison with the previous study.<sup>28</sup> when we calculate the Leishmaniasis Prevalence in the districts, Jajarm has the highest prevalence in the North Khorasan province.

## CONCLUSION

The statistics and figures in this study show that North Khorasan Province is one of the major centers of cutaneous Leishmaniasis in Iran. Since the disease is more widespread among men, aged 16-30, rural residents, and laborers, more than other groups, this factor are necessarily considered in designing and implementation of prevention and controlling of the disease.

## CONFLICT OF INTEREST

The authors declare that they have no conflict of interests.

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