Epidemiology of cutaneous leishmaniasis in Damghan

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Abstract
Aims: Cutaneous leishmaniasis is one of the most important diseases transmitted by sand fly and has been one of the most important health problems in Iran. Determining the epidemiological aspects of disease is important for planning of control program. This study was carried out to describe the cutaneous leishmaniasis situation in Damghan.

Methods: This descriptive-analytical survey was performed on all confirmed and recorded cutaneous leishmaniasis cases (465 people) diagnosed during 2006-09 in Damghan. Patients' information such as age, sex, nationality, habitat, number and sites of ulcer(s), month and years of incidence were registered and analyzed by Chi-square test using SPSS 12 software.

Results: Of 465 under care patients, 263 cases (56.5%) were men and 202 people (43.5%) were women. 148 patients (31.8%) resided in urban areas, while 317 (68.2%) lived in rural areas. The most frequent age group was 20-29 years old (22%). Hands and feet were the most common sites of ulcer (84%). 46% of the patients had two or more ulcers. Highest disease prevalence (84.8%) was observed in months October, December and November.

Conclusion: Cutaneous leishmaniasis is an endemic disease in desert rural areas and is developing in suburban parts of Damghan; therefore, comprehensive planning for control and prevention of the disease is necessary.

Keywords: Cutaneous Leishmaniasis, Epidemiology, Damghan

Introduction
Leishmaniasis is one of the most common zoonotic diseases, which occurs in three forms: cutaneous (oriental sore), visceral (kala-azar), and cutaneous-mucosal [1]. About 350 millions of the world population live in areas which are at the risk of this disease, so that this disease is known as health problem in the most tropical and semi-tropical areas of the world from four continents. The various forms of leishmaniasis have been reported in 88 countries of the world, and at least 12 million people are annually infected with one of its forms [2, 3].

One of the most common forms of this disease is its cutaneous form. Cutaneous leishmaniasis is caused by the sand fly bites contaminated with Leishmania parasite and its symptom is ulcer in different parts of the body that can remain for about a year [4]. Cutaneous leishmaniasis is reported to be about 1-1.5 million cases annually, in the different parts of the world. 90% of the cutaneous leishmaniasis cases are reported in Afghanistan, Algeria, Brazil, Iran, Peru, Saudi Arabia and Iraq [5, 6, 7].

Cutaneous leishmaniasis is one of the most important native diseases in Iran and the second parasitic disease transmitted by arthropods after malaria which is seen in two kinds of urban and rural. About 20 thousand cases of cutaneous leishmaniasis are annually reported from the various parts of Iran which it should be noted that the actual rate is several times more than the reported rate [1, 8].

This disease is posed as a health problem in more than 15 provinces. Despite the measures taken to control this disease, we observe the incident of this disease and its increase in the different cities. Among the causes of this disease factors such as development of the agricultural projects, migration of the indigenous people to the endemic areas, the rapid and unplanned expansion of cities, the construction of residential houses near rodents' nests, the environmental changes including the construction of dams and reduction or discontinuation of the toxin application against malaria vectors [9, 10].

There are various focal points of cutaneous leishmaniasis disease in Iran, in the different parts of the country. One of the most important and relatively new focal points is Damghan. Cutaneous leishmaniasis has been epidemic in the rural areas of Damghan district from 2009 and many cases are reported from catching this disease each year [11].

According to the conducted studies in this district, the disease had been in rural or wet form and the cause of this disease has been introduced to be the Leishmania major and Phlebotomus Papatasi (sand fly) as the main vector in the region. The disease reservoirs are desert rodents, and Rhombomys opimus has been
identified as the main reservoir [12]. The epidemiological characteristics of the disease are different in various focal points, so that the studies conducted in southern Tehran, Isfahan, Yazd and Kashan confirm this point [13, 14, 15]. In order to plan for the disease control, comprehensive information about the effective factors in the disease epidemiology should be available, because this information will beneficially help in control programs. Since no related study had been conducted in recent years in Damghan district, this study was conducted to investigate the epidemiological aspects of cutaneous leishmaniasis in Damghan and comparing it with other regions.

### Methods

This research is a descriptive-analytical study. The subjects were those who had been treated by diagnosis of leishmaniasis from the beginning of 2006 to the end of 2009 in health-care centers of Damghan district with the clinical and laboratory confirmation. 465 patients participated in this study and were selected by census sampling method. First, patients’ information which was recorded by the staff and epidemiological forms of leishmaniasis was extracted from their files. The required data such as age, sex, nationality, place of residence, number of wounds and their location, disease, month and year of the disease incident, and the history of travelling to the disease endemic areas were recorded in the form. Data was analyzed by Chi-square test using SPSS 12.

### Results

263 (56.5%) patients were men. There was a significant relationship between gender and this disease among patients with cutaneous leishmaniasis (p=0.029). The age average of patients was 33.5 and their age range was from 1 to 88. The highest disease prevalence was in the age group of 20-29 years old and the lowest disease prevalence was in the age group of more than 70 years old. There was a significant relationship between the incidence of the disease and the place of residence (p<0.0001).

Most cases were people living in the desert rural areas. 317 patients (68.2%) lived in rural and 148 patients (31.8%) lived in urban areas. The number of patients living in rural areas was twice more than the patients living in the city and there was a significant relationship between the incidence of the disease and the place of residence (p<0.0001). 94 urban patients (63.5%) with cutaneous leishmaniasis resided in the known endemic areas of the disease (in the infected rural area) or had travelled there. 54 patients (36.5%) of urban patient lived in the outskirts. In the survey of the patients’ nationality, it was concluded that 445 patients (95.7%) were Iranian and 20 patients (4.3%) were Afghan.

### Table 1 - The frequency distribution of cutaneous leishmaniasis in different age groups during 2005-2009 in Damghan district

<table>
<thead>
<tr>
<th>Year–</th>
<th>Age group</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-9</td>
<td>6</td>
<td>18</td>
<td>15</td>
<td>14</td>
<td>53</td>
<td>114</td>
<td>14.6</td>
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<tr>
<td>10-19</td>
<td>27</td>
<td>30</td>
<td>20</td>
<td>7</td>
<td>84</td>
<td>18</td>
<td>23.7</td>
</tr>
<tr>
<td>20-29</td>
<td>27</td>
<td>36</td>
<td>22</td>
<td>17</td>
<td>102</td>
<td>22</td>
<td>23.7</td>
</tr>
<tr>
<td>30-39</td>
<td>12</td>
<td>20</td>
<td>21</td>
<td>15</td>
<td>68</td>
<td>14.6</td>
<td>21.7</td>
</tr>
<tr>
<td>40-49</td>
<td>12</td>
<td>15</td>
<td>4</td>
<td>11</td>
<td>42</td>
<td>9</td>
<td>13.9</td>
</tr>
<tr>
<td>50-59</td>
<td>17</td>
<td>10</td>
<td>17</td>
<td>7</td>
<td>51</td>
<td>11</td>
<td>17.2</td>
</tr>
<tr>
<td>60-69</td>
<td>15</td>
<td>7</td>
<td>5</td>
<td>9</td>
<td>37</td>
<td>8</td>
<td>13.9</td>
</tr>
<tr>
<td>70 and above</td>
<td>7</td>
<td>8</td>
<td>5</td>
<td>9</td>
<td>28</td>
<td>6</td>
<td>12.9</td>
</tr>
<tr>
<td>Total</td>
<td>123</td>
<td>144</td>
<td>109</td>
<td>89</td>
<td>465</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

The number of ulcers was between 1 to 15 ulcers and the mean was 1.9 ulcers per person. Among subjects, 251 patients (54%) had an active ulcer, 110 patients (23.7%) had two ulcers, 55 patients (11.8%) had three ulcers and 49 (10.5%) had 4 or more ulcers. The most ulcers were observed in the 39-year-old man whose body had 15 ulcers.

### Table 2 - The frequency distribution of cutaneous leishmaniasis in terms of months during 2005-2009

<table>
<thead>
<tr>
<th>Year–</th>
<th>Months</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>March</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>April</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>May</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>June</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>July</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>August</td>
<td>16</td>
<td>17</td>
<td>15</td>
<td>12</td>
<td>60</td>
<td>12.9</td>
<td>4.3</td>
</tr>
<tr>
<td>September</td>
<td>29</td>
<td>54</td>
<td>37</td>
<td>22</td>
<td>142</td>
<td>30.5</td>
<td></td>
</tr>
<tr>
<td>October</td>
<td>42</td>
<td>54</td>
<td>42</td>
<td>37</td>
<td>175</td>
<td>37.6</td>
<td></td>
</tr>
<tr>
<td>November</td>
<td>32</td>
<td>19</td>
<td>15</td>
<td>14</td>
<td>80</td>
<td>17.2</td>
<td></td>
</tr>
<tr>
<td>December</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>6</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td>January</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>February</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>123</td>
<td>144</td>
<td>109</td>
<td>89</td>
<td>465</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

The disease prevalence had remarkable changes during different months of the year. The frequency
was in a way that the disease outbreak had started in August and reached to the highest level in September and October and then had fallen. The highest disease prevalence was in autumn, so that 84.8% of the disease cases had occurred in this season. Ulcers were 12.9% in September, 30.5% in October, 37.6% in November, 17.2% in December, 1.3% in January and 0.5% in February. No case was observed in April, May, June, July, August and March. There was a significant relationship between the incidence of the disease and the months of year (p<0.0001). Table 2 shows the frequency distribution of cutaneous leishmaniasis in terms of months during 2005-2009.

### Discussion

The results of this study showed that leishmaniasis is a native disease in Damghan district and many people get infected each year. But the process of disease incidence had been declining during 2005-2009. In this study, there was a significant relationship between gender and the incidence of disease. The reason was that more men work or sleep in open areas and also due to men’s less covering than women and more exposure to the infected sand flies [16, 17].

In the present study, there was a significant relationship between age and the incidence of the disease, so that most disease cases were in the age group of 20-29 years old. This group included patients who mostly spend their time on farms and orchards at night without self protection. Therefore, use of personal protection equipment such as insect repellent chisel and covering open body parts is recommended in order to prevent the disease in people who are at the sand fly bites’ exposure [6, 18].

68.2% of the studied patients lived in desert areas and there was a significant relationship between the residence place and the incidence of the disease. These areas are known as focuses of cutaneous leishmaniasis in the conducted studies by researchers [11, 12]. Therefore, major measures are essential in order to reduce the incidence of the disease in the rural areas.

Although the disease type in Damghan district is rural or wet, the findings of this research showed that 31.8% of patients resided in cities. It was also found that 63.5% of urban patients had the history of travelling or going to the infected rural areas. Therefore, the educational programs for the promotion of public awareness must not be limited to the infected rural regions and the necessary information regarding the disease and its prevention should be provided for people by different means.

36.5% of infected patients did not have the history of traveling or visiting the infected areas, but they lived in the city suburbs. Therefore, it could be concluded that these areas can also be considered as a disease focal point regarding the farms and orchards in the suburbs and the existence of the rodents’ colonies. Thus, high-risk urban areas should also be considered in health planning for the disease control.

The prevalence of rural type cutaneous leishmaniasis had remarkable changes in the different months of year and the highest rate was observed in the focal points of the country in October, November, and December [19, 20]. In the present study, the highest prevalence was in autumn, and a significant relationship was observed between the incidence of disease and the months of year, which was consistent with the results of researches in other regions of the country [21, 22, 23]. The reason was related to the activity of the sand flies. In studies conducted in Damghan district, the activity of sand flies had two peaks in June and September [24], but most of their infection had been reported in September [12]. Due to the disease incubation period which is two weeks to two months [1, 19], it is expected that the incidence of most ulcers is in the autumn which is consistent with the results of this study. Therefore, fully protection during summer and early autumn is recommended in order to prevent the disease.

One of the characteristics of the rural type of cutaneous leishmaniasis is that most ulcers are in hands and feet [1]. The obtained results of this study also showed that most ulcers (84%) were in hands and feet which were similar to the results of other studies [21, 22, 23].

92.6% of patients had the ulcers in unprotected parts of body including hands, feet and face. The sand flies are not capable of sucking the blood through clothes due to having short mouth appendices and mostly attack open and unprotected parts of the body. Therefore, the main reason of the ulcer frequency in hands, feet and face is the mentioned point [4, 18, 25]. One of the other obtained results was the number of ulcers in patients so that 15 ulcers were also observed in some subjects. 46% of patients had over one ulcer in their body. The reason of various ulcers could be induced by the biting way of the sand flies; since, these insects do several bites for each stage of the biting. The other reason for the existence of various ulcers could be the abundance of infected flies in one region [18, 25].

Considering the complications of cutaneous leishmaniasis including remaining the scars on the body and also beauty problems and the psychological consequences for patients, the importance of control
and prevention of this disease is more. Therefore, the effective measures which result in decrease of the disease incidence in other parts of the country should be also taken in this district [1, 6, 14, 18, 26, 27].

Conclusion

With regard to the findings of this study, it could be concluded that rural cutaneous leishmaniasis is posed as a health problem in Damghan district and exists endemically in the different parts of the district. Therefore, planning for the disease control and taking appropriate measures to reduce the incidence of the disease are necessary. To implement control programs, suburban areas should be considered as well as the infected villages. Health education, fighting against rodents, environmental reform and proper disposal of garbage and sewage should be also included in the planning. Using poison impregnated mosquito nets insect-repelling chisels will be effective in preventing disease and this issue should be informed through the public media and individual and group training.

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