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Epidemiological study of cutaneous leishmaniasis in southwest of Iran during 2001–2011

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ABSTRACT

Objective: To examine the prevalence process and epidemiological characteristics of cutaneous leishmaniasis (CL) during 2001–2011.

Methods: This was a cross-sectional epidemiologic study examining 2 637 patients with CL in Susangerd county during 2001–2011. The data of all patients who referred to the Prevention Unit of Susangerd Health Center were registered in CL epidemiologic data summary forms. The data and parameters included age, gender, occupation, season, residence (urban, rural), and lesion location.

Results: Out of 2 637 patients, 1 174 cases (44.5%) were females and 1463 patients (55.5%) were males. The maximum rate of infection was recorded in under 10-year-old age group (45.32%) and its minimum rate was seen among those aged over 60 years (0.87%). Among them, 1 557 patients (59.0%) were living in urban and 1 080 (41.0%) were in rural areas. The maximum and minimum occupational frequency distributions were seen in students (49.9%) and farmers (0.6%), respectively. The study showed that the maximum and minimum frequencies were observed in winter (52.33%) and summer (7.62%) correspondingly. The most lesion frequencies from lesion location point of view were related to hands (37.5%), faces (30.0%), feet (26.3%) and other organs (6.2%) and the number of lesions ranged from 1–5 and sized varied from 0.5–5.5 cm

Conclusions: Epidemiological parameters such as age, gender, occupation, season, residence (urban, rural) and lesion location in endemic regions have had significant effects on the prevalence of CL in Susangerd county and the findings can be effective for assessing disease prevention programs. In addition, CL might become a serious dermatological health problem in the near future due to a great population movement to the neighboring country Iraq with a high incidence to an endemic area.

1. Introduction

Leishmaniasis is a parasitic disease with extensive clinical signs. It is a zoonotic disease, which is transmitted by Phlebotomine sandflies and seen in cutaneous [cutaneous leishmaniasis (CL)], visceral (kala-azar) and mucocutaneous forms. The most common type of CL are dry (urban) and wet (rural) forms, which are caused by *Leishmania tropica* and *Leishmania major*, respectively[1-3]. The mortality and disability risk of leishmaniasis are lower than those of any other disease. However, due to creating secondary infections, the length of the treatment of the disease with existing drugs and their side effects has created a lot of problems. Symptoms can include ulcers on the body which can persist up to one year and cause damage to the beauty of faces, hands, feet and body in throughput, which can cause some complications to the patients[4-6]. CL is one of the ten important parasitic diseases in tropical and semi-tropical regions of the world and thus the World Health Organization has recommended and supported researches on different aspects of the disease. CL in countries such

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as Afghanistan, Algeria, Brazil, Iran, Peru, Saudi Arabia and Syria has a high prevalence in which Iran and Saudi Arabia demonstrate the highest prevalence of the diseas[7]. It has infected millions of people in more than 80 countries in the world and is one of the most common endemic diseases to Iran which can be seen in both rural and urban forms. Approximately, 20 000 cases of CL are annually reported from different parts of the country, but the actual amount has been estimated to be several times more. The figures are much less than the actual amount due to various reasons including lack of a significant number of referral patients, especially in underserved areas, problems in the diagnosis and low sensitivity of conventional diagnostic methods in laboratories. The trend of CL prevalence increases in Iran and in recent years new foci of the disease have been identified in different parts of the country[8]. In 2002, a sudden outbreak of CL happened in Mashhad, Northeast Iran. In 2003, the number of cases of CL in the country reached 21 000. However, in 2004 this figure increased to 27 000. The highest incidence of the disease was recorded in provinces of Yazd, Khuzestan, Ilam, Fars, Khorasan and Busher. The lowest incidence was documented in western and northwestern provinces. CL is a disease that factors such as environmental changes, population movement, uncontrolled urbanization and man-made and natural disasters (earthquakes, war) have a significant impact on its epidemiological trend[9-12]. Susangerd with the territory of 5 844 km^2 is one of the cities in Khuzestan Province and has 110 423 residents located 55 km northwest of Ahvaz, the capital of the province, which is categorized as a hot weather area. In endemic and hyper-endemic areas of Iran, extensive studies about CL have been performed by Iranian scientists. However, to the best of our knowledge, this is the first study in relation to the epidemiologic factors in this region, such as the lack of epidemiological studies, a growing number of CL from 2002 to 2003, the trend of the disease growth in 2011, existence of potential reservoirs of the disease and favorable climate conditions. Also, due to the lack of health services and disease contagion of the neihborhood country, Iraq, after opening the border between Iran and Iraq, a large number of people pilgrimage to the Holy Shrines and visit relatives in both countries, which appears to be necessary to conduct the study of the prevalence of the disease[13,14]. This study aimed to investigate the prevalence and epidemiological characteristics of CL performed during 2001–2011[15].

2. Materials and methods

An epidemiological cross-sectional study was carried out over 11 years on 2 637 patients with CL in Susangerd from 2001 to 2011. Wounds were observed using a scalpel from margins where parasites existed more likely. Samples included dermal scrapings of active indurated margins of lesions were smeared onto a glass slide for fixation (using methanol), stained (using Giemsa), and examined microscopically for the presence of *Leishmania* amastigotes. Simple direct questionnaires about clinical and epidemiological information [including ages, genders, clinical symptoms, occupations, places of residence (urban, rural), ulcer sites, seasons and months] were filled out for those patients. The study protocol was performed according to the Helsinki declaration and approved by Ethics Committee of the university. The patients were notified of all the procedures, and a signed informed consent was given to them. Descriptive graphs and tables were used to investigate the trend of changes and ANOVA and linear trend test were applied to check the trends in the period of study and collected data were analyzed by SPSS 20.0 software.

3. Results

The minimum incidence of CL was observed in 2001 with a total number of 73 people, while the maximum incidence was recorded in 2003 with 604 cases. For the duration of 2003–2011, Figure 1 shows a controlled and downward trend and in 2003 a sharp increase in the incidence of the disease.

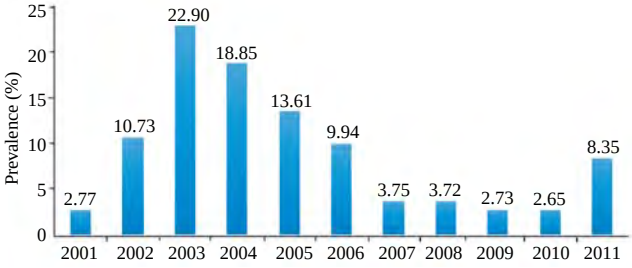

Figure 1. Prevalence of CL in Susangerd from 2001–2011.

Out of 2 637 patients included in the study, 1 463 (55.5%) were males, and 1 174 (44.5%) were females (Table 1), and there was a significant difference between two genders (P = 0.001).

Table 1
Distribution of cases of CL by gender [*n* (%)].

Year	Total number	Male	Female
2001	73 (100)	43 (58.9)	30 (41.1)
2002	283 (100)	179 (63.3)	104 (36.7)
2003	604 (100)	316 (52.3)	288 (47.7)
2004	497 (100)	257 (51.7)	240 (48.3)
2005	359 (100)	196 (54.6)	163 (45.4)
2006	262 (100)	149 (56.9)	113 (43.1)
2007	99 (100)	69 (69.7)	30 (30.3)
2008	98 (100)	56 (57.1)	42 (42.9)
2009	72 (100)	37 (51.4)	30 (48.6)
2010	70 (100)	45 (64.3)	25 (35.7)
2011	220 (100)	116 (52.8)	104 (47.2)
Total	2 637 (100)	1 463 (55.5)*	1 174 (45.5)*

*: P = 0.001.

The age range of the study was 6 months to 85 years and the infection was most prevalent in 0–10 year age group (45.32%) while the lowest prevalence rate was to age above 60 (0.87%) years and the results of *Chi*-square test showed a significant difference between the infection and these two age groups (P = 0.001). Besides, the collected data showed that 1 557 patients (59.0%) living in urban area and 1 080 (41.0%) were from rural areas (Table

2) and the results of *Chi*-square test showed a significant difference between the number of people living in urban and rural areas (P = 0.001). Frequency distribution of occupation showed that the highest rate was documented in students (49.9%) followed by unemployment and housewife (6.9%), soldiers (4.7%), employees (2.4%) and the lowest cases observed in farmers (0.6%) and *Chi*-square analysis showed a significant difference between the infection and the number of patients in terms of occupation (P = 0.001). In this study, the prevalence of the disease from point of season view showed that the highest prevalence rate was in winter season with 52.33% and the lowest in summer with 7.62%, while it was 11.79% in spring and 28.25% in autumn. Statistically *Chi*-square test showed that the disease had the lowest point during July (2.0%) and August (2.5%) (Table 3) and *Chi*-square test analysis showed a significant difference for the number of patients with respect of winter and summer seasons (P = 0.001).

Table 2
Distribution of CL cases by rural and urban area [*n* (%)].

Year	Total	Rural	Urban
2001	73 (100)	37 (50.7)	36 (49.3)
2002	282 (100)	161 (57.1)	121 (42.9)
2003	604 (100)	184 (30.5)	420 (69.5)
2004	497 (100)	113 (22.7)	384 (77.3)
2005	359 (100)	214 (59.6)	145 (40.4)
2006	262 (100)	116 (44.3)	146 (55.7)
2007	99 (100)	47 (47.5)	52 (52.5)
2008	98 (100)	39 (39.8)	59 (60.2)
2009	72 (100)	33 (45.8)	39 (54.2)
2010	70 (100)	40 (57.1)	30 (42.9)
2011	220 (100)	95 (43.2)	107 (56.8)
Total	2 637 (100)	1 080 (41.0)*	1 557 (59.0)*

*: P = 0.001.

Table 3
Distribution of CL cases by months [*n* (%)].

Month	Number
April	170 (6.4)
May	67 (2.5)
June	74 (2.8)
July	53 (2.0)
August	63 (2.5)
September	85 (3.2)
October	155 (5.9)
November	207 (7.8)
December	383 (14.5)
January	559 (21.2)
February	645 (24.5)
March	176 (6.7)
Total	2 637 (100.0)

P = 0.001.

Out of those 2 637 cases, 2 373 (90.0%) had a single lesion and 264 patients (10.0%) had multiple lesions. All patients based on the lesion locations had lesions on faces in 790 cases (30.0%), hands and arms in 990 cases (37.5%), feet and legs in 693 cases (26.3%), backs in 20 cases (0.8%) and abdomens in 15 cases (0.6%), while the remaining (4.8%) was related to other organs (such as neck and ear). The number of lesions ranged between 1 and 5 and size of the lesions ranged from 0.5 to 5.5 cm.

The noduloulcerative lesions were the most common form of lesions, occurring in 1 414 cases (53.5%), while papulonodular lesion occurring in 1 127 cases (42.5%) and vegetative lesions occurring in 96 cases (4.0%) were less common lesions (Figures 2 and 3). The duration of lesions was from 1–13 months as reported by the patients.

Figure 2. Papulonodular lesion on the forehead of a 8-year-old girl diagnosed with CL.

Figure 3. Multiple papulonodular lesions on a arm of a 16-year-old girl diagnosed with CL.

4. Discussion

It seems that for leishmaniasis control, epidemiological and ecological studies are of utmost importance to assess risk factors for spread of the disease and preventive measures. From another point of view, in control of diseases that are transmitted by insects initially, sufficient epidemiological information must be always collected such as geographical distribution, insect seasonal abundance and its relation to age, gender, occupation, place of injury, *etc*. In fact, without accessing to this information, no control procedure can be operated in one area to prevent the disease.

Literally, incidence and distribution of leishmania can be described based on clinical symptoms, though it may have remained hidden and unknown even in areas with health care centers and the disease continues to operate silently behind the scenes[15]. As a matter of fact, leishmaniasis cases are annually reported in Susangerd due to hot weather and ecological and geographical conditions. According to this, study data showed that leishmaniasis had an increasing trend until 2003 which can be considered as a result of the regime change in Iraq, reopening of both side borders and increasing travel of pilgrimages to holy shrines in the Iraq. Furthermore, other factors for the increased trend were underlying such as the increase of rainfall, lack of proper drainage around the city, using old preventive methods and lack of supervision and control over reproduction of vectors "sandflies". In contrast, such a decreasing trend from 2003 to 2007 justified as prevention units had a strong performance in field of modern methods of prevention through the elimination of stray dogs and lair of mice around the city. In addition, dumping waste in the right way, using proper water drainage around the city, training health workers and using experienced staff can be cited as other important factors for reducing the disease.

According to Figure 1, it can be seen that the control process were continued until 2010. However, a sharp increase in incidence of the disease for a second time can be seen in 2011 possibly due to the increase in amount of rainfall, breakdown in control of disease reservoirs, increased urbanization and uncontrolled construction on disease reservoirs.

The results of the current study indicated that in terms of seasonal disease prevalence and comparison with studies completed in other cities, the distribution of the disease is highest in late autumn and early winter. However, the disease is endemic in all seasons in Susangerd[16-18].

Base on the obtained results, the disease is always more common among men (55.5%) than women (44.5%) which was consistent with studies from other parts of the country (Kermanshah, Ilam and Isfahan, Southwest Iran). What probably caused more men than women to be exposed to the disease are cultural and behavioral factors and the types of coverage, occupation as well as more attention of women than men to their health[16,17,19,20].

Evaluation of CL between urban and rural population was appreciated that the incidence rate of the disease was higher in urban population (59.0%) than that in rural population (41.0%) from 2001–2011. One reason for this could be due to the greater sensitivity of urban population to the disease and their easy access to health centers.

According to the results, most common lesions were seen in hands (37.5%), faces (30.0%) and then feets (26.3%) and the remainder was related to other organs. One of the factors affecting the distribution of lesions in patients' body could be the individual coverage. Additionally, sandflies prefer to select a suitable location of the body for feeding with a view to olfactory and chemical attractions. Dose of carbon dioxide leads the insects to find a suitable site on the host body for blood feeding. These attractive materials in hands and feet are higher than other parts of the body. In terms of the age factor, most CL cases observed in children aged under 10 years (45.32%) and *Chi*-square analysis showed that the prevalence rate was significantly higher as compared to other age groups (P = 0.001), which was consistent with concluded studies from Kashan, Hormozgan[21,22]. The obtained results were quite different with studies from Kasiri[4], Zahirnia[23], Amraee[24] and Mesgarian[25] in which they documented the most frequent in ages over 30 years, while Uzun *et al.* from Turkey documented that the most CL cases were observed in age group of 10–19 years[26].

Epidemiological factors such as age, gender, season, occupation, lesion site and habitual locality had significant impact on the prevalence of leishmaniasis in endemic areas. Due to climatic conditions, it is a bit tough to prevent the disease. However, it is recommended to operate procedures on identifying potential reservoirs and also ways of disease transmission for people, particularly students through health centers in schools. It is also needed to extend proper notification to visitors at country entrances and exits so that full knowledge of seasonal vector transmission would take actions for preventive measures.

Conclusively, CL might become a serious dermatological health problem in the near future because of population movement from the neighboring country with a high incidence of an already endemic area. What's more, unfavorably affects on the prevalence of CL in our region could also increase the risk of exposure to leishmaniasis. For that reason, in order to decrease the risk of exposure, we suggest that routine health controls must be implemented, effective measures must be set in place for vector control, housing conditions of the people in highly endemic areas must be improved and infected individuals must be diagnosed and treated to prevent spread of the infection.

Conflict of interest statement

We declare that we have no conflict of interest.

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