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Epidemiology of cutaneous leishmaniasis in Sidi Kacem Province, Northwestern Morocco (2006–2014)

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ABSTRACT

Objective: To describe the epidemiological profile of cutaneous leishmaniasis (CL) in Sidi Kacem Province, North-Western Morocco between 2006 and 2014.**Methods:** The *Leishmania* parasite (amastigotes) was identified by direct microscopic identification after staining. May-Grünwald Giemsa was the method used to diagnose CL in Sidi Kacem Province between 2006 and 2014. The collected data were exploited by using Microsoft Office Excel 2010 and the geographical distribution was prepared by the Geographical Information System ArcGIS Version 10.2.**Results:** From 2006 to 2014, 415 cases of CL were reported in Sidi Kacem area. The incidence of this skin disease that had affected all age groups was 49.1 cases per year and the sex ratio (M/F) was 0.85. Children aged 15 to 19 represented the most affected class with more than 28.2% of the study population. Also, CL affected virtually the rural and urban areas but with an uneven incidence. It is more important in rural areas where they were registered 56.85% of cases against 43.15% in urban areas.**Conclusions:** The retrospective analysis has showed that cutaneous leishmaniasis is still major public health problem in Sidi Kacem Province. Indeed, this disease which presented an evolution according hyperendemic fashion can become endemic to the future in this province which borders the endemic area of Ouazzane. We highlight the cutaneous leishmaniasis incidence through the Sidi Kasem area during the last 8 years (2006-2014).

1. Introduction

Cutaneous leishmaniasis (CL) is one of the most important vector-borne diseases of humans. It is a skin infection caused by a single-celled parasite of the genus *Leishmania* and spread by the bite of infected female sand flies. The incidence of CL is estimated between 0.7 and 1.2 million new cases per year. Approximately 75% of CL is reported from 10 countries: Afghanistan, Algeria, Brazil, Colombia, Costa Rica, Ethiopia, Islamic Republic of Iran, North Sudan, Peru, and the Syrian Arab Republic[1,2].

In Morocco, this skin infection caused by three *Leishmania* species (*Leishmania tropica*, *Leishmania major* and *Leishmania*

infantum rarely) is widely distributed. Its distribution is linked to well-described climate zones. Over the past two decades, the epidemiological situation of CL has acquired an increasingly epidemic status with geographic expansion to previously free areas in several areas of Morocco[3-5].

In Sidi Kacem Province, north-west of Morocco, CL is a major public health problem. Indeed, since 1997, the incidence of this affection has been significantly increasing[6].

2. Materials and methods

2.1. Study area and population

Sidi Kacem Province (located in north-western of Morocco) covers an area of 3061 km² and bounds on the west of the Sidi Slimane Province, the north of the Tanger-Tetouan-Al Hoceima region, east and south of Fez-Meknes region. This province is administratively structured around 5 pachaliks, 5 circles, 4 urban districts, 12 caïdats, 5 urban communes and 24 rural communes

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The study protocol was performed according to the Helsinki declaration and approved by the health delegation of Sidi Kacem.

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with a population of 522270 and 70% inhabitants in rural areas. The average population density is about 169 inhabitants per km².

2.2. Sampling and diagnosis

In Morocco, the method used to diagnose CL was parasitological examination that involved direct microscopic identification of the *leishmania* parasite (amastigotes) after staining May-Grünwald Giemsa[7]. Indeed, all smears prepared by qualified nurses at different community health centers belonging to the Sidi Kacem area were sent to Epidemiology And Environmental Health Laboratory of Infrastructure Service Provincial Ambulatory Shares Sidi Kacem for staining and identification.

2.3. Epidemiological data

The retrospective analysis was based on the exploitation of patients' registers and the reports infected with CL by the local medical services during 2006–2014. These epidemiological data analyzed were collected from annual reports of leishmaniasis by the regional health directorate of Gharb Chrada Beni Hcen and records of the health delegation of Sidi Kacem.

2.4. Data analysis

Epidemiological data were exploited by using Microsoft Office Excel 2010 and the geographical distribution was prepared by the Geographical Information System Arc GIS Version 10.2.

2.5. Ethical statement

The study protocol was performed according to the Helsinki Declaration and approved by the health delegation of Sidi Kacem.

3. Results

3.1. Temporal distribution and sex ratio

Sex has been recorded in 406 patient files (gender was not mentioned on 7 sheets). The sex ratio and annual incidence of CL cases in Sidi Kacem Province were shown in Figure 1.

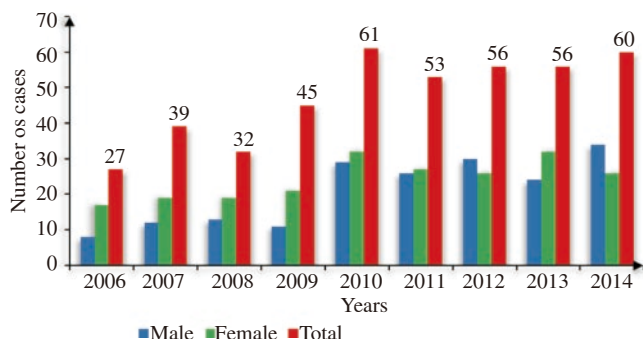


Figure 1. Sex ratio and annual incidence of CL in Sidi Kacem, 2006–2014.

With an average of 46.1 cases per year, the total number of CL cases recorded in Sidi Kacem Province presented an evolution in growing oscillations between 2006 and 2014. The minimum case was recorded in 2006 with 27 cases and maximum in 2010 with 61

cases. Also, CL affected both sexes with a female predominance whose percentage was 53.94% against 46.06% for males and a sex ratio (M/F) was 0.85.

3.1.1. Distribution by type of area

The results of the distribution of CL cases according to the type of area were given in Figure 2.

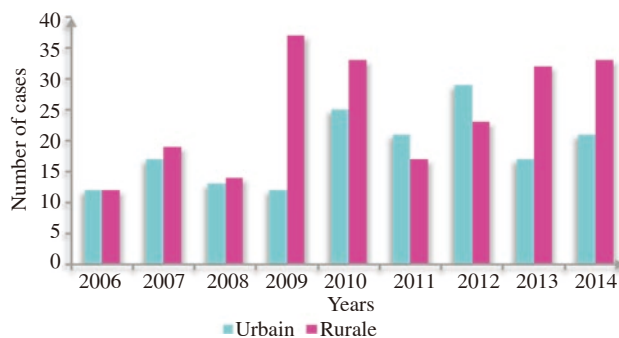


Figure 2. Distribution of CL cases according to the nature of area in 2006–2014.

In the study area, CL practically affected the rural and urban areas but with an unequal incidence. It is higher in rural areas where it recorded 56.85% of cases against 43.15% in urban areas. This slight predominance of rural cases was observed in all years except 2006.

3.1.2. Breakdown by age group

The breakdown by age groups of CL cases recorded during our study period was shown in Table 1.

Age range	Number of cases	%
[0–9]	77	18.6
[10–19]	117	28.2
[20–29]	55	13.2
[30–39]	43	10.4
[40–49]	35	8.4
[50–59]	43	10.4
[50–59]	45	10.8
Total	415	100.0

Between 2006 and 2014, all age groups were affected by CL in Sidi Kacem region, but with unequal proportions. The most affected was the class whose aged between 10 and 19 years (28.2%), while the least affected was between 40 and 49 years (8.4%).

3.1.3. Geographical distribution

According to the data collected from patient records, we mapped the average incidence of CL in the various communes of Sidi Kacem Province between 2006 and 2014 (Figure 3).

The results displayed on the map (Figure 3), showing a high concentration of cases in the communes occupying the center and east of the province. The most affected commune was the urban of Sidi Kacem with an average of 15.66 cases per year. The rural commune of Ain Dfali, with an average of 7.33 cases per year, ranked second. Annual average event between 1 and 5 cases was recorded at three rural communes (Zirara, Zegota and Tekna) successively with 3.22, 1.67 and 1.11 cases per year. The reduced number of cases (lower than 1) was recorded in 24 of the 29 communes of the study area.

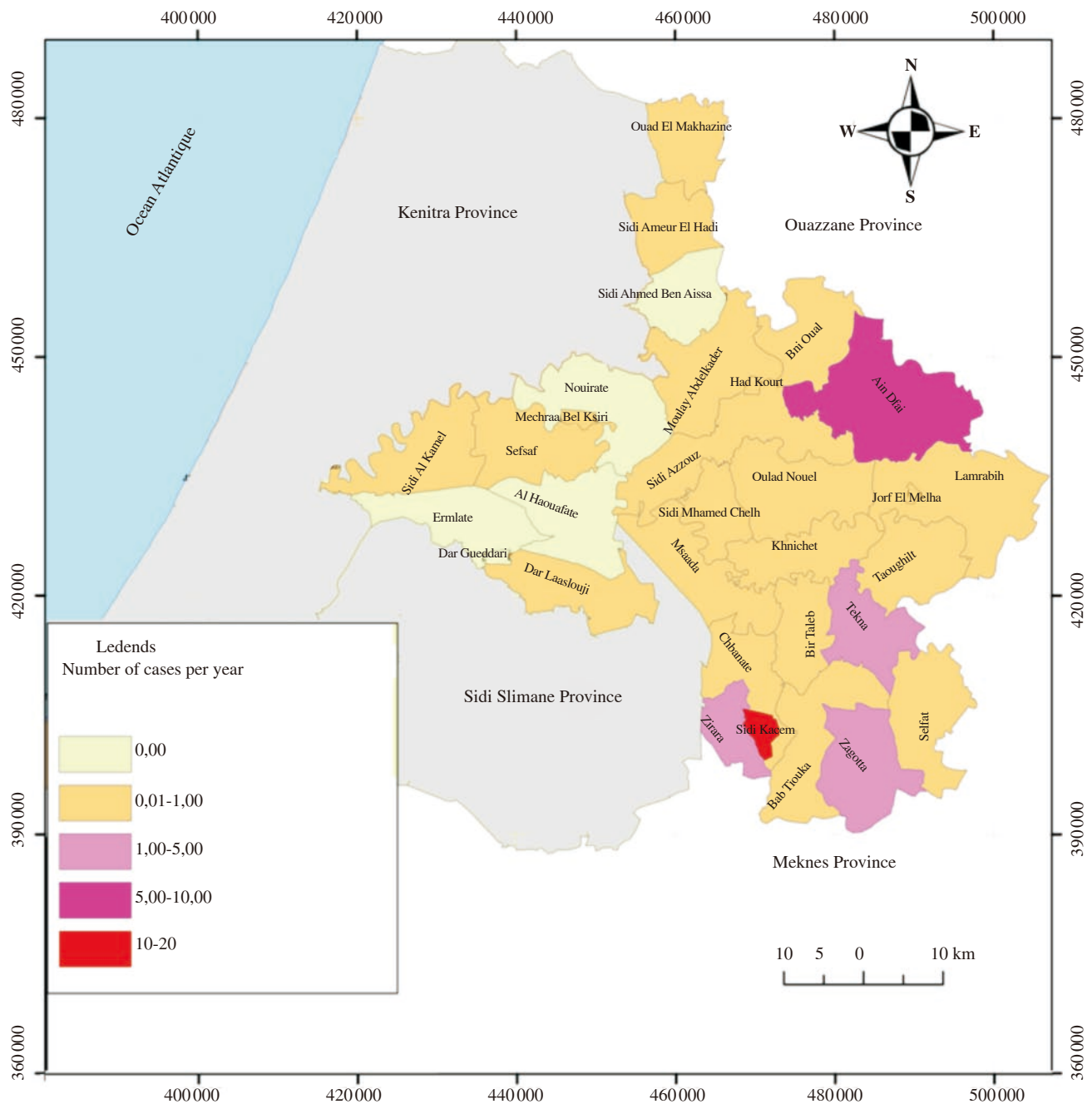


Figure 3. Geographical distribution of annual incidence of CL of communes in 2006–2014.

4. Discussion

In Sidi Kacem Province, the results obtained during the 9 years concerned by this study show that the temporal evolution of annual incidence of CL was increasing oscillation with maximum cases (61 cases) in 2011 and annual average of 46.1 cases per year. This increase can be explained, in part by improved reporting and the care of patients, and secondly by the increase actual numbers of cases, favored by environmental changes related environment, climate change, agricultural development and the development of new water resources (installation of irrigation canals, artesian wells, etc.) and also by uncontrolled urbanization (shantytowns and slums). All these factors contribute to the creation of wet microclimates favorable to the development of sandflies and thus the cycles of leishmaniasis[8,9].

For sex ratio, we noticed a female predominance with 53.94% against 46.06% for males and a sex ratio (M/F) was 0.85. This result

is similar to that reported by Chiheb *et al.* in Northern Morocco in 1999[10]. It can be explained by the fact that men, because of their occupation or negligently consult only in case of complications, which resulted a male under declaration[11,12]. In 2003, the female predominance was also reported in Tunisia and Burkina Faso, while sex ratio was in favor of males in Mali and Egypt[13-16]. Among the cases of CL found in this study, 56.85% are in rural areas against 43.15% from the urban environment which confirms the rural character of this infection[17]. Thus, in the urban areas, most of the cases were reported in slums and peripheral neighborhoods, which confirm the role of unplanned urbanization in the spread of this infection to urban centers[6,18].

Our study showed that all age groups were affected by the CL and children and young people whose age is between 6 months and 30 years are the most infected population with over 60% of cases. The average age of patients was 24.7 years. This result is very close to

that obtained by Chiheb *et al.* in Northern Morocco which reported an average age of 24.6 years[10]. In Brazil, Murback *et al.* found a higher average age (44 years)[19].

The spatial distribution of CL in Sidi Kacem Province was not homogeneous. According to the results, a high concentration of cases was recorded in the communities occupying the east and center of the province. This unequal distribution may be due to the action of environmental factors, especially those related to climate and geography[20]. It therefore appears that in addition to environmental factors whose effect is already confirmed on the spatial distribution of CL and their vectors, the effects of altitude in turn influence the geographic distribution of these parasites in the North-West Morocco[6,21-23].

In conclusion, this study confirms the public health problem related to the spatio-temporal extension of CL in Sidi Kacem Province that is a part of the active focus of Northern Morocco.

Conflict of interest statement

We declare that we have no conflict of interests

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