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Research Article

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An Epidemiological Study of Cutaneous Leishmaniasis in the Cities of Sirte and Jadu, Libya: During 2019-2020

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Abstract

Cutaneous leishmaniasis CL is a complex clinical syndrome caused by transmitting an intracellular parasite to humans through sand fly bites. Libya is one of the countries endemic to CL. The goal of this study is to study the epidemiological aspects of CL from 2019 to 2020 in Sirte and Jadu. Demographic and epidemiological data for all patients were collected from health centers by the National Center for Disease Control in Libya. Descriptive statistics were used to describe the characteristics of the study data**.** A total of 355 people with CL were identified. 143 CL-positive cases in Jadu and 212 in Sirte. The highest prevalence of affected age groups was found among patients aged 10 to 19 (17 %). The peak incidence of the disease occurred in the autumn. The most common locations of lesions were the legs and hands. Treatment was mentioned only in 30 % of registered cases. CL remains a health problem with medical and social consequences in the cities of Sirte and Jadu. To minimize the risk of disease, it is highly recommended to manage reservoir hosts and disease vectors, as well as provide education on personal protection measures.

Keywords: Epidemiology; Cutaneous leishmaniasis; Sand fly; Parasite; Pentostam; Sirte; Jadu**.**

INTRODUCTION

Leishmaniasis is a complex clinical syndrome caused by the transmission of an intracellular parasite to humans through sand fly bites (Mostafa et al. 2021; Organization WHO 2013). It is a serious global health problem with potentially fatal consequences in its visceral form. It is considered one of the seven major tropical diseases identified by the World Health Organization (WHO) (Organization WHO 2013). There are more than 98 countries endemic to leishmaniasis, putting 350 million individuals at risk of infection. A high prevalence of leishmaniasis is found in the poorest countries due to neglect of health care and infrastructure by governments and a lack of knowledge and health awareness of diseases (Olias-molero et al. 2021). This zoonotic disease is induced by an intracellular protozoan of the genus Leishmania, which typically exists in a commensal relationship. The natural transmission of Leishmania parasites occurs through sandflies from the genera Phlebotomus (in the Old World) or Lutzomyia (in the New World) (Mandell 2005). Sand flies have a length of only 3.5 mm, are covered by thick hair, and are active between evening and dawn. The seasonal preferences and geographical range of sand flies

vary by species. The majority of species can endure temperatures between 16 and 44°C. Only the female sand fly consumes blood from mammals, as it requires these meals to ensure proper egg development (Doha and Samy 2010).

According to geographical location, leishmaniasis was divided into the Old and New World. Old World leishmaniasis is found in Asia, Africa, and Europe, primarily caused by L. tropica, Leishmania major, Leishmania aethiopica, Leishmania infantum, or L. donovani. Conversely, New World leishmaniasis occurs in the Americas and is mainly attributed to Leishmania mexicana, Leishmania amazonensis, Leishmania braziliensis, Leishmania panamensis, or Leishmania infantum chagasi (Lupi et al. 2009; Kevric et al. 2015). According to the Libya National Center for Disease Control (NCDCL), Libya is endemic to cutaneous and visceral leishmaniasis, the infection rate of CL has increased, with approximately 19,396 cases recorded between 1971 and 2011 in the cities of Nafusa Mountain, such as Nalut, Gharyan, and Yafran, in addition to Tawergha Al-Khoms and Tarhuna. Visceral leishmaniasis has been reported in Libya for over 80 years (Jain et al. 1990). All these reports originated from the northern coastal regions, close to Tripoli and the Green Mountain area. Since 2011, Libya has been embroiled in an armed conflict, which has exacerbated the healthcare system and hampered national disease-control programs. These risk factors have contributed to the spread of CL and increased the number of registered cases, which has risen to over 25039 between 2012 and 2022. Due to the high rate of cutaneous leishmaniasis in Libya over the past years, which requires monitoring the epidemiological situation of the disease in various regions, As a result, the current study sought to evaluate the current situation of CL disease in Sirte and Jadu cities during the years 2019–2020 in terms of prevalence, demographic parameters associated with CL disease, and the impact of seasonal changes.

MATERIALS AND METHODS

Study Areas: This study was conducted in the cities of Sirte and Jadu, Libya. Sirte is located in the central region of Libya, within 452 kilometers of Tripoli city. (31º 12′ 17″ N and 16º 35′ 17″ E. The coastal areas of Sirte are characterized by mild Mediterranean weather for most of the year, while the areas away from the coast are characterized by hot summers and cold winters. Jadu is a mountain city in western Libya in the Jabal al Gharbi District, approximately 180 km away from Tripoli (31º57'00″ N and 12º01′00″ E). Jadu enjoys a cold, humid climate in the winter and desert weather, which is hot, dry, and windy in the summer.

Data collection: The Administration of Zoonotic Disease-Control- National Center for Disease Control-Libya (NCDCL) collected data from 355 patients at hospitals in Sirte and Jadu from 2019 to 2020. CL was diagnosed using the direct smear technique, which detected amastigotes in smears prepared from the lesion margin after staining with Giemsa and then examined under a light microscope. All data collected was entered into a cutaneous leishmaniasis reporting form. This encompasses patients' demographic details, including age, gender, occupation, residence, the number of acute lesions, the date of lesion onset, any prior travel history to other endemic areas, findings from clinical examinations and laboratory tests, the treatment regimen employed, and patients' nationality. The data were analyzed using the Exel Microsoft program version 10 for Windows.

RESULTS

From 2019 to 2020, 355 CL cases were reported in Sirte and Jadu cities. During this time, there were 143 CL positives in Jadu and 212 in Sirte (Figure 2). The patients studied ranged in age from one to 71 years old, with females (36 %) and males (64 %) participating. Figure 2 depicts

the age distribution of CL patients. There were statistically significant differences in occurrence between age groups. CL cases were mostly reported among people aged 10 to 19 years.

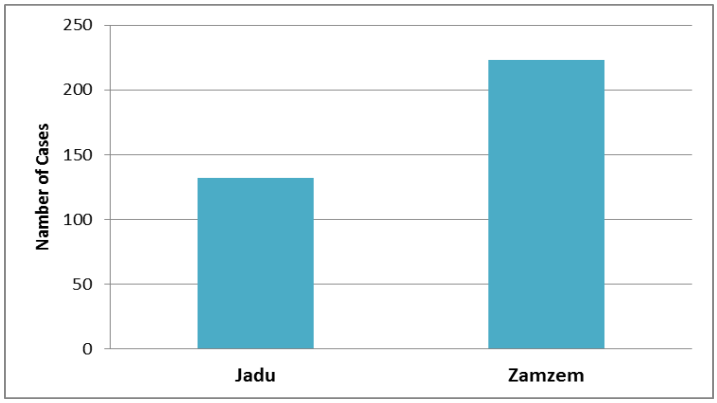


Figure: (1). Cutaneous leishmaniasis cases in Sirte and Jadu cities during 2019-2020.

The disease exhibited the highest prevalence (17 %) in the 10-19 age group, while the lowest prevalence (11 %) was observed in the 50-59 age group. Additionally, 12 % of the patients were over 60 years old, and 15% were under 10 years (see Figure 2).

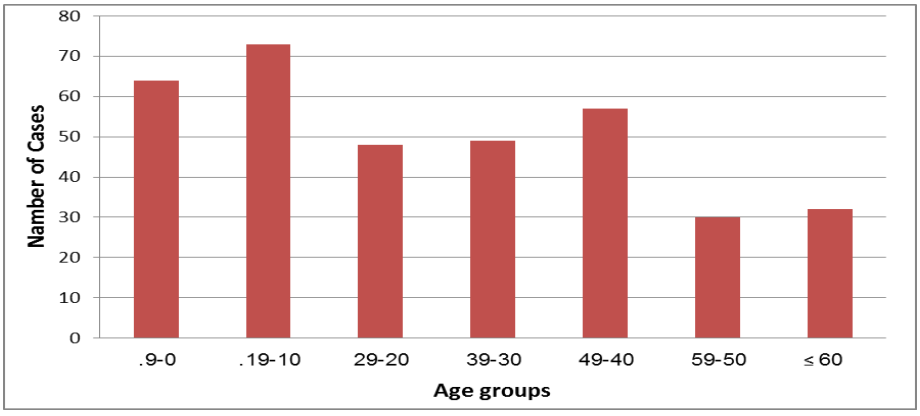


Figure: (2). Cutaneous leishmaniasis cases in Sirte and Jadu cities during 2019-2020 compared with age groups.

The percentage of cutaneous leishmaniasis (CL) cases among males was 64 % (228 out of 355), while the proportion of female cases was 36 % (127/355). In general, men were more likely than women to develop CL. There were significant differences between the sexes**.**

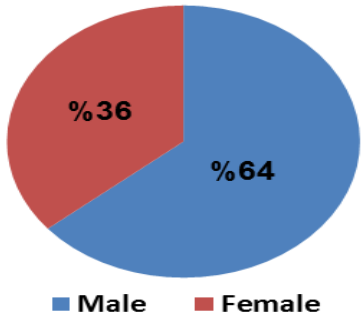
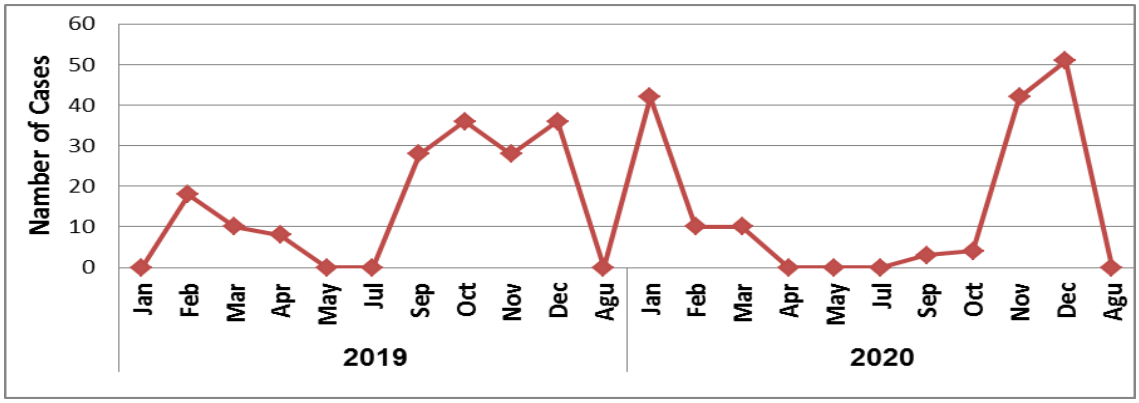


Figure: (3). Cutaneous leishmaniasis cases in Sirte and Jadu cities during 2019-2020 compared with gender

The majority of cases were documented during the autumn and winter seasons rather than during the summer, with prevalence varying by month. The highest number of cases was noted in December, November, October, and September, compared to the number of CL cases in January, February, March, and April of 2019. As for 2020, the highest infection rate occurred in January, followed by a decrease in February and March, followed by April. The number of cases increased again in October, November, and December. The final results clearly demonstrated that the prevalence of the disease varied by month. Figure 4 illustrates the fluctuations in cutaneous leishmaniasis prevalence across different years and months.



Figure; (4). Distribution of cutaneous leishmaniasis cases in Sirte and Jadu cities during 2019-2020 per month

A large number of reported CL cases in our results were found to have lesion(s) on their legs (28 %), followed by patients with CL lesions on hands (23 %), CL lesions were located on the face in 11% of cases and 18 % on the arms. In addition, the largest proportion of CL (23 %), were reported to have multiple lesions at more than one location. A study of the relationship between the location of lesions and gender revealed that 70 cases (30 %) of male CL patients had a leg lesion, while 56 cases (24 %) had a hand CL lesion. 18 % of male CL patients were found to have multiple lesions. The results showed that 38 cases (30 %) of females had CL lesions on their arms, while 33 cases (26 %) had CL lesions on their faces. 30 female cases (23.6 %) had skin CL lesions in more than one location. The results are shown in Figure 5.

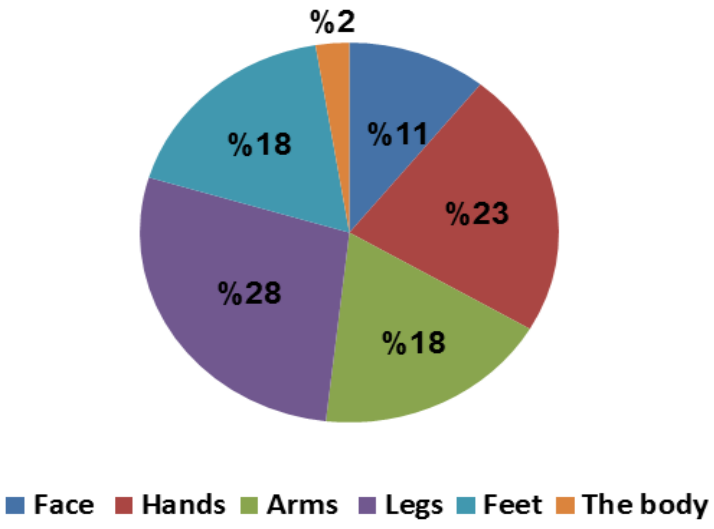


Figure: (5). Distribution of cutaneous leishmaniasis cases in Sirte and Jadu cities with regard to lesion site(s).

Among the 355 cases of cutaneous leishmaniasis recorded in the Sirt and Jadu cities in 2019-2020, only 105 cases were recorded for the type of treatment, and 70 % of cases were not recorded. In these cases, intralesional treatment with pentostam was the most effective treatment followed by antibiotics and then systemic treatment (pentostam IM) at 5 %. Cryotherapy was effective in only 2 % of cases (Figure 6).

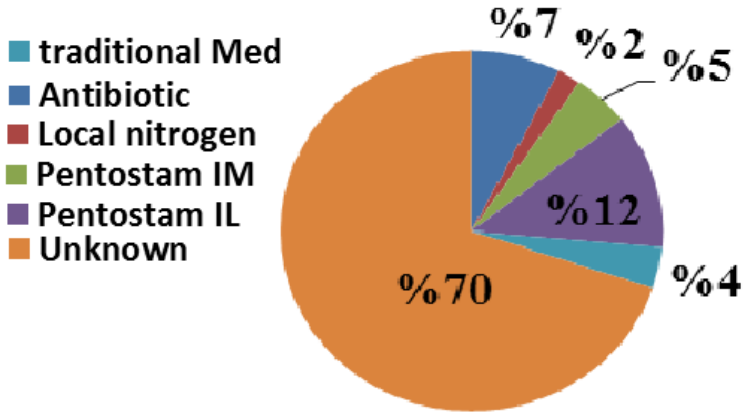


Figure: (6). Cutaneous leishmaniasis cases in Sirte and Jadu cities during 2019-2020 compared with treatment types.

DISCUSSION

The World Health Organization regards leishmaniasis as one of the most significant parasitic diseases, and the World Health Assembly has recommended prioritizing its management (Gonzalez et al. 2008). Due to the intricate epidemiological cycle of the disease, involving multiple reservoirs and vectors with complex ecological interactions, effective surveillance and control pose significant challenges. In Libya, cutaneous leishmaniasis is classified as an endemic disease (Aoun and Bouratbine 2014). Several studies have clearly, confirmed the endemic city of CL in Libya's northwestern areas (Ashford et al. 1976; Amro et al. 2012). The reported areas were Misrata (Beni Walid) (Aoun et al. 2006) Yafran, jebel-Naffussa, Nalut regions, Al-Jabal Al Gharbi, and Sirte (Fathy et al. 2009; Abdellatif et al. 2013; Ashford et al. 1977; Ashford et al. 1976; El-Buni et al. 1993). Despite previous reports of lower incidence in the West, cases have increased and extended to the Tunisian border (Kadiki and Ashraf 1971).

In our study, we investigated epidemiology, demographic parameters, and types of treatment for CL patients in Sirte and Jadu cities from 2019 to 2020. Our results confirmed that cutaneous leishmaniasis still represents a public health concern. Where during this time, a total of 355 CL cases were discovered. There were 143 CL-positives in Jadu and 212 in Sirte. The incidence of CL has increased significantly in Jadu in recent years, in comparison with a previous study conducted during the period from 2007 to 2011, which recorded 93 cases (AboAssara et al. 2015). While in Sirte, a study was published in 2006-2007 about registering 163 patients in the health centers of Al-Gadaheya and Al-Hisha villages (Fathy et al. 2009). Our findings indicated that the infection was related to gender, as the disease was more prevalent in males than females, with a percentage of 64%. Other studies in Libya Province yielded similar results (AboAssara et al. 2015; Elammari et al. 2008). Males may have a higher prevalence due to several risk factors, such as clothing habits, travel to endemic areas, the habit of sleeping outside their homes during hot nights, and environmental conditions that contribute to increased direct contact with sand fly habitats and vector-related influences. This suggestion is in agreement with a previous study (El-Buni et al. 2000).

Some researchers believe that levels of sex hormones may impact the development and progression

of certain parasitic diseases, potentially increasing males' susceptibility to protozoan infections. (Roberts and Walker 2001). In these studies, the overall prevalence of cutaneous leishmaniasis is greatest among individuals aged 0-9 and 10-19. These age groups, which encompass school-aged children and young adults in Libya, tend to engage in outdoor activities more frequently than others, increasing their exposure to environments associated with sand flies. Moreover, Mendonça SC (2016) indicates that cutaneous leishmaniasis infections lead to the establishment of lifelong immunity, which could explain the reduced incidences observed in older adults. Because the population in some parts of Libya has recently changed, the disease can now be seen in people of all ages.

As shown in Figure 4, patients were examined between January 2019 and December 2020. The greatest number of cases was recorded in September, October, November, and December 2019, followed by January, February, and Mars 2020. The number of cases decreased in April and May before increasing again in October, November, and December 2020. According to research in other areas of Libya, such as Yafran or Sirte (El-Buni et al. 2000), the highest prevalence occurred between November and February, or during the autumn months, likely attributable to the parasite's extended incubation period, which lasts from 4 to 12 weeks following a sand fly bite. Variations in incidence across seasons and/or regions may be explained by differences in distribution and ecological factors (Bounoua et al. 2013).

CL lesions can occur anywhere on the body, and there have been several reports of unusual locations (Kevric et al. 2015; Boelaert et al. 2008). In this study, both single and double lesions were present in different cases, with 77 % having a single lesion and 23 % having double or more lesions, contradicting Fathy et al. (2009), who indicated that most lesions were numerous (73 %). Furthermore, the most common location was the legs (28 %), followed by patients with CL lesions on the hands (23 %), 11 % cases with CL lesions on the face, and 18 % on the arm. Our findings are consistent with the findings of two other studies (Faraj et al. 2013; Alsamarai and Al obaidi 2009). The presence of cutaneous leishmaniasis lesions on the face and extremities can be attributed to patients' sleeping patterns, as their faces, hands, and limbs are more vulnerable to sand fly bites during the night when these insects are most active.

However, there is still a gap in CL treatment, and the lack of standardized protocols for evaluating anti-Leishmanial activity impedes and challenges drug development (Groge et al. 2013). Only 105 of 355 cases of cutaneous leishmaniasis in the cities of Sirt and Jadu in 2019-2020 were recorded for treatment type, and 70 % of cases were not recorded. In these cases, intralesional pentostam was the most effective, followed by antibiotics, and then systemic treatment (pentostam IM) at 5 %. Cryotherapy had a 2 % efficacy rate. The first-line drugs for the treatment of CL, Pentavalent antimonial medications [meglumine antimoniate and sodium stibogluconate], as advised by the WHO, are not accessible for all cases of cutaneous leishmaniasis. In endemic regions of Libya, liquid nitrogen cryotherapy has been employed as the primary treatment for CL, especially in children, avoiding the adverse effects associated with local, multiple, and repeated injections, aligning with the results of a Libyan study (Abdellatif et al. 2013; Mosleh et al. 2008). The management and prevention of cutaneous leishmaniasis in Libya encounter numerous obstacles, including population displacement, high population density, civil conflict, inadequate health literacy, and limited access to healthcare services. Additionally, our study faced certain constraints in data collection and reporting, as individuals in endemic regions might forgo prescribed treatments due to the belief that the disease is easily curable. Not all patients underwent laboratory testing, with many diagnosed based solely on clinical signs. Moreover, some individuals may have utilized traditional remedies, which would not have been documented.

CONCLUSION

As in all endemic areas in Libya, leishmaniasis remains a health issue with medical and social im-

plications in Sirte and Jadu cities. Environmental changes and climate shifts have significantly contributed to the rising incidence of Leishmania infections in these regions. Additionally, the manifestation of lesions showed considerable variation among patients. These factors combined require more intensive and accurate research to determine the extent of the disease in this region, as well as sand fly control programs and host animal control, in addition to the need for community awareness.

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Author contributions: Contribution was equal between authors**.**

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