Sawa Medical Journal

Reprint from

Vol.1 Issue.2 2025

Sawa Medical Journal

Epidemiology Study of Cutaneous Leishmaniasis in AL-Muthana Province (2016-2022)

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Abstract

Cutaneous Leishmaniasis has been a long-standing public health concern in Iraq. The study on leishmaniasis epidemiology in Iraq indicates that the disease has been endemic in various regions for many years. Leishmaniasis is an ancient disease in Iraq known by different local names, including “oriental sore”, “Aleppo button”, “Jericho boil”, Delhi boil,“ sister” and "Baghdad boil", which used to be common until a few decades ago. This study aimed to identify the spread of cutaneous leishmaniasis in Muthanna province, Iraq, by analyzing patient data based on gender, age, and location. Data collection took place from December 3, 2023, to March 10, 2024, and was conducted by the AL-Muthanna Health Department and the Statistics and Control Unit, involving all registered cases in the governorate's districts. The data was organized in statistical tables, categorized by years from 2016 to 2023, and analyzed using the (SPPS version 23) program, The chi-square test was used to identify significant differences in total cases, age groups, number of infections among patients, region, gender, and age at a probability level of $P<0.05$.

The study based on statistical analysis of diagnosed cases of cutaneous leishmaniasis, the results revealed that males were more prevalent, accounting for 59% of the cases, while females accounted for 41%,the analysis showed that males were slightly more frequently affected by cutaneous leishmaniasis compared to females with a significant difference of ($p\leq0.05$) during the years 2016-2023. The age distribution of patients with cutaneous leishmaniasis CL showed that the highest frequency was observed among individuals aged 5-14 years (41%).

Keywords: Leishmaniasis, Baghdad boil, *Leishmania tropica*.

Introduction

Human Leishmaniasis, is a parasitic disease classified as neglected tropical disease (NTD), in certain regions of the tropics, subtropics, and southern Europe, Leishmaniasis affects millions of people worldwide in a variety of ways as it is reported in number of reports by The Centers Of Disease Control And Prevetion (CDC), It is characterized by a range of disorders affecting the skin, mucosa, and viscera, which are mostly determined by the parasite species and the host immune system.[1]

The term "leishmaniasis" describes a group of clinical symptoms brought on by obligatory intracellular protozoa of the Leishmania genus.[2] Humans are inadvertent hosts of this vector-borne zoonosis, which is commonly reservoir-borne in dogs, rats, wolves, and foxes. Every year, over 1.5 million new cases are reported, and over 350 million people reside in regions where parasite transmission is prevalent.[3]

Geographically, leishmaniasis is classified as either Old World (found in Africa, Asia, the Middle East (Saudi Arabia, Iraq, Iran), the Mediterranean, and India) or New World (found in Central and South America), which causes cutaneous or mucocutaneous leishmaniasis.[4] *Leishmania.major and Leishmania. tropica* considered as common causes of CL in Iraq, They discover that three leishmania species are responsible for CL. Leishmaniasis. *tropica (L.tropica), Leishmania.major(L.major),*and *Leishmania. Infantum(L.infantum)*.[5]

One of the four types of the illness, CL is the most prevalent and a significant public health issue in 88 nations where it is endemic. Diffuse cutaneous leishmaniasis (DCL), mucocutaneous leishmaniasis, and visceral leishmaniasis (also known as Kala-azar) are the other three clinical types. Although it is rather uncommon, diffuse cutaneous leishmaniasis is typically linked to mucous membrane involvement.[6]

The illness leishmaniasis is spread by tiny bloodsucking insects called sand flies. The genus Phlebotomus, family Psychodidae, subfamily Phlebotominae, and order Diptera are all home to sand flies. The Phlebotominae family of sand flies is comprised of six genera and around 700 species. However, only two genera are significant in medicine: Lutzomyia in the modern world and Phlebotomus in the ancient world.[7]

Depending on the parasite species and the immune response of the patient, CL is more prevalent in rural than in urban areas, has an incubation period of 2–8 weeks, and first manifests as a localized skin

lesion at the site of inoculation, typically uncovered sites, the face, upper limbs, and lower extremities.[8] In CL, an erythematous papule first grows into a nodule, which then ulcerates and crusts over. The border is raised and distinct, forming a painless ulcer with a well-defined raised border, measuring 0.5 to 10 cm in diameter. The ulcer is painless unless it is associated with a bacterial or fungal infection, and the sores may change in size and remain over time. In certain cases, multiple lesions may occur, and the nose, mouth, and pharynx are among the clinical manifestations. The primary issue with this illness is the depressed scar that results after healing.[9] This study aimed to determine the spread of epidemiological distribution CL by gender, age, and year in Al-Muthanna province.

Materials and Methods

1. Office work: The office work for the research project started on (October 28, 2023). To gather information, various sources were used, such as English and Arabic medical books, research papers, theses, and dissertations related to the research topic. Additionally, data from relevant health institutions and centers were also relied upon.

2.Field work: The field work for the research project focused on the cutaneous Leishmania parasite, Data collection took place from(December 3, 2023, to March 10, 2024). AL-Muthanna Health Department collaborated in collecting the data from the Statistics and Control Unit, The collected data included all registered cases of the disease in the districts of the governorate. The data was organized in statistical tables, categorized by years from 2016 to 2023, and analyzed using the(SPPS version 23) program, The chi-square test was used to identify significant differences in total cases, age groups, number of infections among patients, region, gender, and age at a probability level of $P<0.05$.

Results and Discussion

1- Distribution Of Cutaneous Leishmaniasis

The results revealed that males were more prevalent, accounting for 59% of the cases, while females accounted for 41%. ($p\leq0.05$), However, significant difference in gender distribution was observed between males and females. In summary, the analysis showed that males were slightly more frequently affected by cutaneous leishmaniasis compared to females, but this difference was not statistically significant.

2- The prevalence of cutaneous Leishmaniasis by sex

Cutaneous leishmaniasis is a parasitic disease transmitted by vectors that is commonly found in tropical, subtropical, and Southern European regions, According to the World Health Organization, there

are approximately 1.5 million cases of cutaneous leishmaniasis worldwide. In Iraq, both *L. major* and *L. tropica* are common causes of the disease, particularly in rural areas. While cutaneous leishmaniasis is self-limiting, it cantake several months or even years to fully recover, often leaving behind noticeable scars.[10,11] In this study, (1,858) cases of cutaneous leishmanias were recorded in Al-Muthanna Governorate during the years 2016-2023.The results of the analysis showed that 59% of the patients diagnosed with cutaneous leishmaniasis were male, while 41% were female, ($p \leq 0.05$).

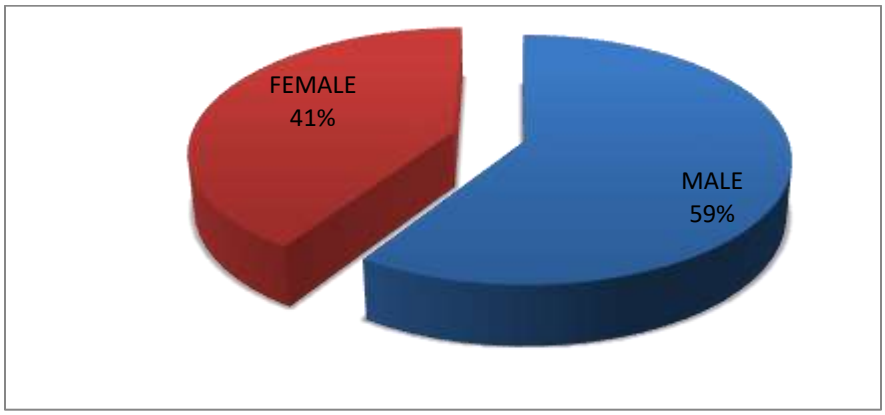


Figure (1): The prevalence of cutaneous leishmaniasis by sex

Males are more likely than females to be exposed to infected vectors, which may be caused by things like working or sleeping in open spaces with less body covering.[12] Some studies have suggested that hormonal effects may play a role in the observed sex differences in certain parasitic diseases. However, there is still ongoing debate regarding the involvement of sex hormones in the immune response.[13]

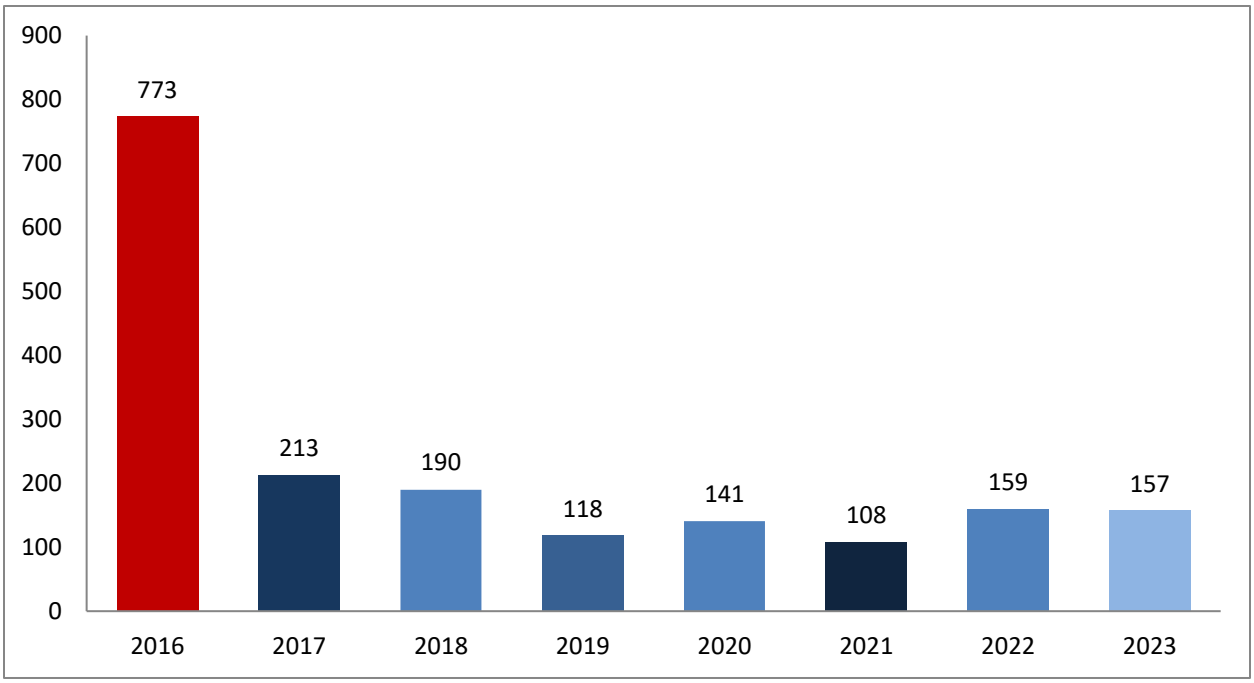
Previous studies conducted in Iraq have consistently shown higher rates of cutaneous leishmaniasis in males compared to females. For example, studies in Al-Qadisiya,[14,15] and AL-Haweja city [6] all reported a higher proportion of male patients ranging from 57% to 43%. Similarly, a study conducted in Iran by [16] that 71% of the patients diagnosed with cutaneous leishmaniasis were males, which is higher than the 56.6% male rate observed in the present study, This suggests a higher prevalence of the disease among males in Iran.

However, the study conducted by [17] in Wasit city reported a higher rate of infection in females compared to males. These differences may be explained by the fact that these regions are more exposed

to insect bites, particularly in agricultural settings where a majority of farm workers are females. This suggests that factors such as occupational exposure and behavior can also contribute to the varying rates of cutaneous leishmaniasis among males and females in different regions. while the present study shows a higher proportion of male patients with cutaneous leishmaniasis, it is important to consider the findings from other studies in Iran, Brazil, and Iraq that demonstrate both male and female predominance in different regions. These variations may be attributed to factors such as exposure to infected vectors, hormonal effects, and occupational or behavioral factors , and these results are similar to what was reached in many previous studies. [18] [19]

Table No. (1): Distribution Of CL According To Gender Over The Years From (2016 -2023).

Year	Infected Males	% Males	Infected Females	% Females	Total Cases
2016	505	65%	268	35%	773
2017	112	52%	101	48%	213
2018	100	53%	90	47%	190
2019	68	43%	50	57%	118
2020	88	62%	53	38%	141
2021	63	58%	45	42%	108
2022	86	54%	73	46%	159
2023	85	54%	72	46%	157
TOTAL	1106	-	752	-	1858



Figure(2): Distribution of Cutaneous Leishmaniasis Over The Years From (2016 -2023).

3- Distribution Of Cutaneous Leishmaniasis according to age group

The findings of the study indicate that the vulnerable age groups span a wide range of ages, from (1year old to over 45 years old). The highest incidence of infections occurred between (2016 and 2021), particularly in the age group of 5-14 years, surpassing other age groups. On the other hand, the age groups of less than (1year and over 45 years) had lower infection rates compared to other groups. These results are presented in Table No. (2), with a significance level of $P<0.05$. During the years (2020-2023), the highest infection rate was observed in the age group of 1-4years, specifically in (2021). In that year, there were 89 cases of infection, accounting for 40% of the total infection. Conversely, the highest infection rate in the age group over 45 years occurred in (2019), but only 4 cases were recorded, representing 2.5% of the total number of infections in that year, the study reveals that certain age groups, such as 5-14 years, are more susceptible to infections, while other groups, like less than one year and over 45 years, have lower injury rates.

Table No.(2): Overview of Infected Individuals by Age Group group during the following years (2016-2023) in Al-muthanna province.

Year	<1 Year	1-4 Years	5-14 Years	15-45 Years	>45 Years
2016	17 (2%)	200 (26%)	417 (54%)	131 (17%)	8 (1%)
2017	12 (7%)	26 (15%)	87 (49%)	46 (26%)	5 (3%)

2018	20 (11%)	45 (24%)	55 (29%)	38 (20%)	32 (17%)
2019	9 (8%)	35 (31%)	41 (36%)	25 (22%)	4 (4%)
2020	12 (9%)	49 (35%)	35 (25%)	38 (27%)	6 (4%)
2021	17 (8%)	89 (40%)	69 (31%)	43 (19%)	6 (3%)
2022	14 (9%)	49 (31%)	40 (25%)	29 (18%)	27 (17%)
2023	0 (0%)	47 (32%)	51 (34%)	46 (31%)	5 (3%)

The age distribution of patients with cutaneous leishmaniasis CL showed that the highest frequency was observed among individuals aged 5-14 years (41%). This was followed by the age group of 1-4 years (28%), then 15-45 years (21%), and the least frequency was in the age group of infant (<1) (5%) and age group of 50-80 years (4%). The lower frequency of infections in individuals above 15 years (adults) may be due to the development of resistance and immunity against CL as a result of previous exposure to the parasite.[20]

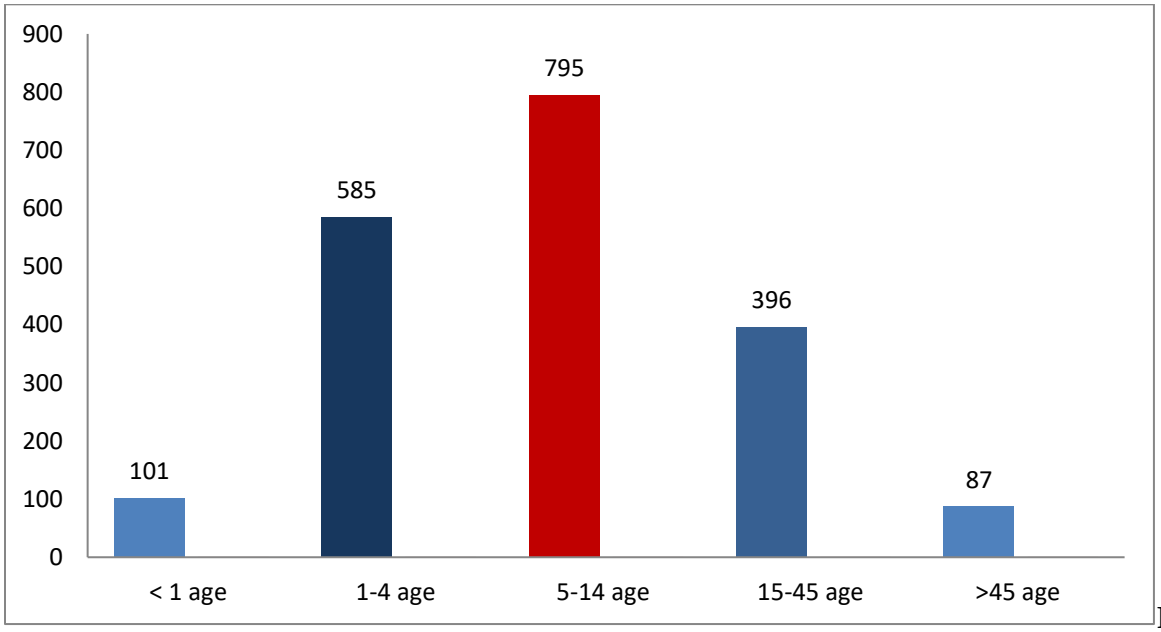


Figure (3): number and percentage of CL infection among the age group during the following years (2016-) in ALmuthanna province.

The combination of behavioral, physiological, and environmental factors makes the age group from 5-20 more vulnerable to cutaneous leishmaniasis in Al Muthanna, due to the following reasons according to[21] [5] :

Behavioral Factors : Children and teenagers in this age group are more likely to engage in outdoor activities and play in areas where sandflies, the vector for leishmaniasis, are present ,their behavior puts them at a higher risk of exposure to the parasite causing the disease, there may be gender disparities in activities that expose individuals to sandfly bites. For example, boys might engage in outdoor activities more often than girls, leading to a higher risk of infection among boys in this age group.

Weakened Immune System : The immune system of individuals in this age group is still developing, making them more susceptible to infections like cutaneous leishmaniasis. Their immune response may not be as strong in fighting off the parasite compared to adults, moreover, inadequate nourishment might impair immunity, increasing a person's vulnerability to diseases like cutaneous leishmaniasis. Inadequate access to nutritious food in this age group can exacerbate their vulnerability to the disease.

Lack of Awareness : Children and young adults may not be as informed about preventive measures against leishmaniasis compared to older individuals. They may not take precautions such as using insect repellent or wearing protective clothing, increasing their chances of getting infected.

Living Conditions : In regions where leishmaniasis is prevalent, factors such as poor housing conditions or proximity to sandfly breeding sites can contribute to a higher incidence of the disease among younger age groups who may be more exposed to these environments, In some cases, children or teenagers in this age group may sleep outdoors or in poorly constructed housing where they are more exposed to sandflies during the night, further increasing their risk of contracting the disease, Low socioeconomic status can limit access to protective measures, such as insect repellents or proper housing, thereby exposing children and teenagers to higher risks of contracting cutaneous leishmaniasis.

Migration and Displacement :In regions like Al Muthanna, where there may be movements of populations due to conflicts or other reasons, individuals in the 5-20 age group who are displaced or living in temporary shelters may be at an increased risk of contracting cutaneous leishmaniasis due to unstable living conditions, Movement of individuals from endemic areas to Al Muthanna or vice versa can introduce new strains of leishmaniasis parasites to the region, potentially increasing the risk of infection for young individuals.

Climate Change: Alterations in climate forms, such as rise temperatures or changed rainfall patterns, can affect the distribution and behavior of sandflies, potentially leading to a higher incidence of cutaneous leishmaniasis among the younger population.

Poor Waste Management : Improper waste disposal practices in communities can attract sandflies, creating breeding grounds near residential areas and schools, Poor sanitation practices, such as open defecation or lack of clean water sources, can attract sandflies to residential areas and exacerbate the transmission of leishmaniasis among the younger population, furthermore, Insufficient measures to control the sandfly population in Al Muthanna, such as lack of insecticide spraying or environmental modifications, can lead to sustained transmission of leishmaniasis among the younger population.

Similar findings have been reported in previous studies conducted in Iraq, such as those by [15] in Al-Qadisiyah province, and [22] in West province. These studies also found that the majority of CL patients were young people under the age of 20, with the highest infection rates occurring in those under 20 years old.

Other studies conducted in Iran by Khatami *et al*,. 2007 [23] and in Pakistan by Khalid *et al*,. 2012,[24] also demonstrated a high prevalence of CL among individuals under 20 years old. However, there are some variations in findings from different regions. For example, Al-Samarai and Al-Obaidi (2009)[6] in Alhaweja District in Kirkuk Province found that the incidence rate of CL infections was highest (57%) in patients over 20 years old.

According to Al-Mashhdani 2002 [25] found that the majority of injuries in Baghdad occurred in the age range of 10-15 years. In Hawija district, Mahmood 2006[18] discovered that the majority of individuals with East ulcer were over 15 years old.

In Al-Qadisiyah Governorate, Al-Myali 2004 [26] found that the age group of 5-10 years had the highest percentage of leishmaniasis cases, which is in line with the findings of Kashkol 2009.[27] To summarize, different studies have identified various age groups as being most affected by CL disease, ranging from 1-7 years to 10-15 years and even up to 16-40 years. The specific age group with the highest incidence can vary depending on the location and population studied.

4- Distribution of Cutaneous Leishmaniasis among of the following year (2016-2023).

The study observed fluctuations in the number of skin leishmaniasis cases over the years 2016-2023. In 2016, there was a peak in the number of cases, with February recording the highest number of infections (773 cases). This accounted for 36% of the total cases for that year. Conversely, 2021 had the lowest number of cases, with only 108 reported instances. The period between 2019-2022 showed varying trends in skin leishmaniasis cases. In 2021, the highest incidence rate was recorded in January, with 93 cases, constituting 41% of the total cases for that year. Conversely, the lowest rates of injuries

occurred in 2020 during June and July, with only one case reported each month, representing 1% of the total cases in 2020, ($p \leq 0.05$)..

Table (3): show number of infected individuals in CL in al-Muthana province during the month of the following years (2016-2023).

Year	Month	No. of Infected Individuals	Percentage
2016	January	206	27%
	February	279	36%
	March	240	31%
	April	11	1%
	November	11	1%
	December	26	3%
2017	January	56	26%
	February	28	13%
	March	15	7%
	April	1	1%
	May	14	7%
	June	2	1%
	July	4	1%
	August	2	1%
	September	10	5%
	October	9	4%
	November	12	6%
	December	60	28%
2018	February	50	26%
	March	45	24%
	April	60	32%
	December	35	18%
2019	January	41	35%
	February	40	34%
	March	10	8%
	May	2	2%
	July	3	3%
	August	3	3%
	November	5	4%
	December	14	12%
2020	January	21	16%
	February	47	36%
	March	5	4%
	April	6	5%
	May	2	2%
	June	1	1%
	July	1	1%
	November	8	6%
	December	38	29%
2021	January	93	41%
	February	57	25%

	March	27	12%
	April	4	2%
	May	4	2%
	June	5	2%
	September	1	1%
	October	7	3%
	December	27	12%
2022	January	54	56%
	February	43	44%
2023	January	62	35%
	February	55	31%
	December	60	34%

Researchers like Al-Mayali,2004 [26] and Kashkhol ,2009 [27] indicated that the monthly distribution of infection cases typically starts to appear and increase from December, peaking in January and February, However, Al-Mashhdani, 2002 [25] mentioned that Baghdad experienced an increase in cases in January by 13%, followed by December. This discrepancy in monthly distribution may be linked to the activity of sand flies influenced by climatic conditions such as temperature and humidity during the study period. The development of female sand flies requiring blood for egg maturation and lifecycle completion, especially in spring, may contribute to these variations.

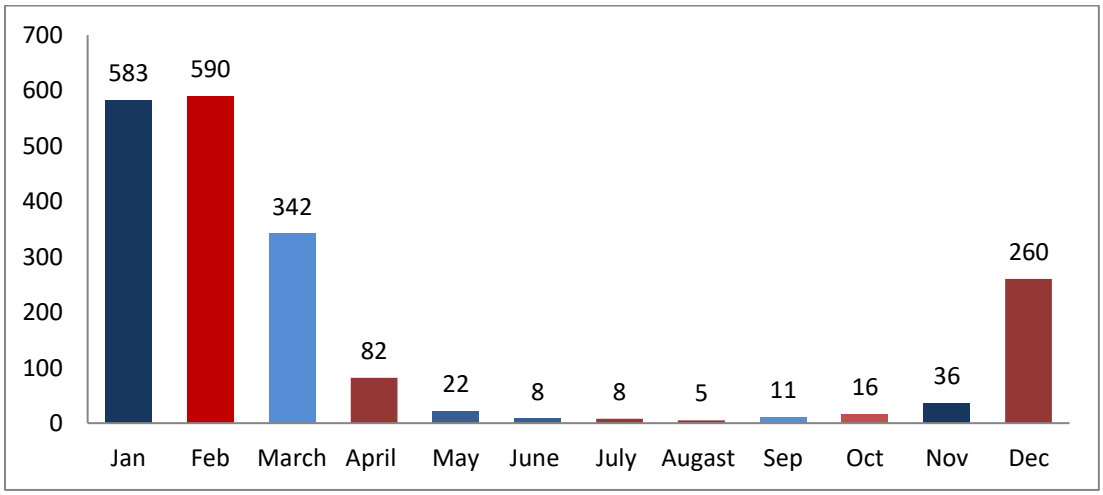


Figure (4): Distribution of CL among the month of the following years (2016-2023).

5- Distribution Of Cutaneous Leishmaniasis according To Incubation Period And Time Of Symptoms Appear During The Year.

The incubation period of cutaneous leishmaniasis, which refers to the time between infection and the onset of symptoms, can vary depending on various factors, including the Leishmania species involved and the individual's immune response , and the site of infection can influence the duration of the incubation generally, the incubation period ranges from a few weeks to several months , the transmission of cutaneous leishmaniasis is influenced by the activity of sand flies, which are the primary vectors of the disease,sand flies are typically more active during warmer months, particularly in regions with a Mediterranean climate,therefore, the spread of cutaneous leishmaniasis is more likely to occur during the months when sand fly activity is at its peak, While some cases may present symptoms within a few weeks, others may remain asymptomatic for months before the characteristic skin lesions appear,

As for the appearance of symptoms, they usually become noticeable after the incubation period, these symptoms can include skin lesions, typically in the form of ulcers or nodules, that may be accompanied by itching, pain, or inflammation, the timing of symptom onset can vary depending on the individual and the specific circumstances of the infection Understanding the incubation period is crucial for early detection and prompt treatment of cutaneous leishmaniasis to prevent complications and promote successful recovery.[28]

Conclusion:

Male distribution infection was more than female and highly in age ranging (11-20) year and was slightly less in infants and elderly. CL infectious in urban regions was less than rural regions. Studies suggest hormonal effects may play a role in the sex differences observed in certain parasitic diseases. However, there is still controversy surrounding the involvement of sex hormones in the immune response.

Source of funding : The source of funding for this work was personal finance**.**

Conflict of Interest: the authors declare there is no conflicts of interest.

Ethical approval: The current study obtained ethical approval by Sawa University.

Acknowledgment

We would like to thank the College of Health and Medical Techniques at Sawa University for letting us use the to use equipment and materials.

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