

## A Demographic and Epidemiological Investigation of Patients Afflicted with Cutaneous Leishmaniasis in The Diyala Government Region of Iraq

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ARTICLE INFO	ABSTRACT
<p><b>Keywords</b></p> <p>Cutaneous leishmaniasis, demographical study, epidemiological study, leishmaniasis.</p>	<p>Leishmaniasis considers one of the public health issues over the world. The risk of infection increases when expose to the blood-sucking sandflies that facilitate the parasite transmission between mammalian hosts, including humans in a few cases, that carry the metacyclic promastigotes during the infection. The present study aimed to investigate the demographical and epidemiological characteristics of 75 patients infected with cutaneous leishmaniasis (CL) compared to a healthy control group. The current findings referred that the employment patients have a non-significantly higher percentage compared to non-employment patients, the females have a non-significantly higher percentage. While in the not-employed patients, the males have a non-significant higher percentage. Additionally in urban, the proportion of CL was not significantly higher in males. While in rural, the results were different. Also, the percentage of CL was significantly higher in Khan Bani Saad position in Diyala province compared with other positions, the percentage of infected females was significantly higher than males at this position. The present findings referred that the job type, living style and position have a main role in the prevalence rate of the disease in rural and urban cities and gender has no role in the etiology of the disease.</p>

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## 1. Introduction

Leishmaniasis deemed as a group of infectious parasitic diseases caused by a protozoan of *Leishmania* genus [1]. Also, it is representing a globally health problem over the world transmitted by various types of *Leishmania* genus, representing a danger to the individuals who travel or live-in the endemic areas. Recent statistics indicate that approximately 12 million people are infected with leishmaniasis over 98 countries, and approximately 350 million people are at risk of infection [2]. Parasites of *Leishmania* are transmitted over the bite of females' sandfly from the genus *Phlebotomus* in the old world or the genus *Lutzomyia* [3]. Female's sandflies can infect humans and cause cutaneous, mucocutaneous, or visceral leishmaniasis through injecting the metacyclic promastigotes of *Leishmania* parasite into the exposed skin. The clinical signs depended on the type of *Leishmania* parasite that was causing them and the host's resistance. With the rise of ecotourism and adventure travel in the past, cutaneous leishmaniasis—once confined to rural tropical and sub-tropical communities—is now a growing problem among tourists [4]. There are two morphological phases in the life cycle of these protozoa: the first phase included the elongated promastigotes with seen flagella that inhabit sandfly guts, while the second phase included the round-formed amastigotes without seen flagella that inhabit the mammalian cells [5]. During the infection, the metacyclic promastigotes are carried through the blood-sucking sandflies that mediate the transmission among mammalian hosts, in a few human cases, the hosts might also additionally stay asymptomatic for a long term, and therefore play a vital role in leishmaniasis transmission to their regions [6]. The insect vector leaves metacyclic promastigotes on its host's skin during the blood meal. The infection is started by these promastigotes, which are the most aggressive type of *Leishmania*. After a varying incubation period, a little erythema appears at the location of the sandfly bite as the first sign of infection. The erythema develops into a papule, then a nodule, which eventually becomes the recognizable lesion of localized cutaneous leishmaniasis over a period of two weeks to six months [7]. Leishmaniasis will be classified into 3 main kinds. in keeping with its clinical appearances: cutaneous leishmaniosis (CL) that affects only the skin localized components (the foremost frequent model of the disease), mucocutaneous leishmaniasis (MCL) which has the ability to break-down the mucosal tissue and is just spread in America known as espundia in south America, and the dum dum fever or Kala azar or visceral leishmaniasis (VL) which is that the less frequent variety of leishmaniasis however causes spleen and liver distention and might be deadly if it doesn't receive prompt medical aid [8].



Although CL is not life-threatening or fatal, it can cause severe social stigmatization and ugliness. The symptoms begin as erythematous papules, which typically develop into nodules, then crusted ulcerated lesions. Due to parasite replication in the dermis, they develop near the site of the sandfly bite [9]. The aim of the present study is to investigate the demographical and clinical factors that associated with cutaneous leishmaniasis.

## **2. Experimental and subjects**

The participants of the cutaneous leishmaniasis patients and the healthy control's volunteers enrolled to Baqubah Teaching Hospital at Baqubah city in Iraqi Diyala province, were involved in the current study. The personal consent was obtained from all participants before the required information was collected. Regarding the scientific research ethics, the study approved according to the Helsinki declaration for Human subjects' research [10], and the ethics confirmed by University of Baghdad and University of Diyala. The contributors of the cutaneous leishmaniasis group were composed from 75 patients (include 39 males and 36 females) with age mean  $\pm$  SD  $23.91 \pm 13.14$  years, in comparison to the an apparently healthy control group that matched the patients' group age, gender, and number. Also, the healthy control group composed from 75 volunteers (involve 38 males and 37 females) with age mean  $\pm$  SD  $22.84 \pm 4.35$  years. All the study contributors were from Diyala urbans and rurales. The urbans included in the study were Diyala governate center, Suburbs and Districts of Diyala governorate. The present study included the demographical and epidemiological information of the Studies' volunteers such as the age, gender, living location, lesions types and shapes. These data were analyzed by using two computer programs, the IBM SPSS computer program version 28.0 [11], and WinPepi version 11.65 [12], the independent t-test and Pearson's chi- square was used to calculate the probability between the studied groups. The differences were significant when the p-value was less than 0.05.

## **3. Results and discussion**

The present results showed that the ratio of leishmaniasis patients was non-significantly higher in the employment patients compared with the non-employment patients (92.0% vs. 8.0%, respectively), and in females than males in employee patients' group (97.2% vs. 87.2%). While in the non-employed leishmaniasis patients' group, the males have the non-significantly highest ratio compared to females (12.1% vs. 2.8%) (Table 1). Also, on one hand, there was a non-significant difference ( $P < 0.05$ ) between the gender ratio of the leishmaniasis group compared to the control



group, and between both groups according to the job ratio from the other hand (Table 1). In addition, the living position results in table 2 showed the frequency percentage of cutaneous leishmaniasis patients was non-significantly higher in urban than rural patients (50.67% vs. 49.33%, respectively). Also, the urban males have a non-significant increased frequency than females (53.8% vs. 46.2%, respectively). In contrast the females have the non-significant increased frequency than males in rural (52.8% vs. 47.2%) (Table 2).

**Table 1:** The frequency of employment status and gender between the studied groups

Job	Patients group No. (%)			Control group No. (%)			Probability
	Males	Females	Total	Males	Females	Total	
Employee	34 (87.2)	35 (97.2)	69 (92.0)	32 (84.2)	36 (97.3)	68 (90.67)	0.795
Not employee	5 (12.8)	1 (2.8)	6 (8.0)	6 (15.8)	1 (2.7)	7 (9.33)	0.906
Total	39 (52.0)	36 (48.0)	75 (100.0)	38 (50.67)	37 (49.33)	75 (100.0)	0.870
Probability	0.109			0.051			

**Table 2:** The living positions of the studied groups

Living position	Patients group No. (%)			Control group No. (%)			Probability
	Males	Females	Total	Males	Females	Total	
Urban	21 (53.8)	17 (47.2)	38 (50.67)	26 (68.4)	24 (64.9)	50 (66.67)	0.761
Rural	18 (46.2)	19 (52.8)	37 (49.33)	12 (31.6)	13 (35.1)	25 (33.33)	0.960
Total	39 (52.0)	36 (48.0)	75 (100.0)	38 (50.67)	37 (49.33)	75 (100.0)	0.870
Probability	0.566			0.744			

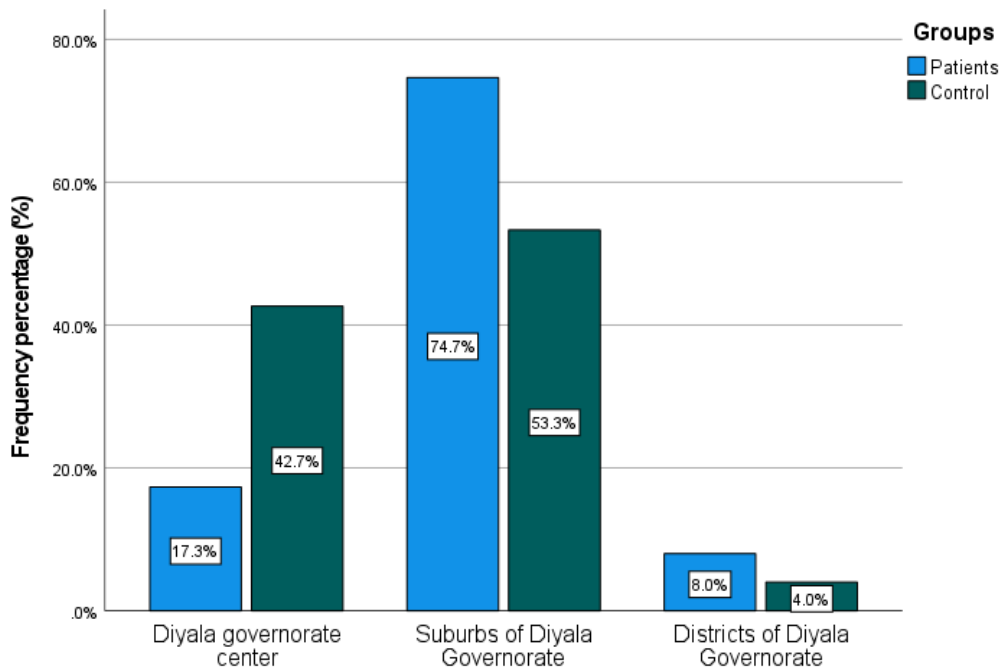
Such the demographical distribution of the leishmaniasis patients in the current study referred that the highest frequency percentage was in suburbs of Diyala governate (Table 3) especially Khan Bani Saad position (Fig. 1). In addition, the frequency percentage of females was higher than males in this position (27.8% vs. 23.1%, respectively) (Fig. 2). While the frequency percentage of other



positions ranged from 2.6% to 7.7% in males and from 2.8% to 11.1% in the females' group (Table 4). There was a significantly increased frequency percentage of *Leishmania* infections between the gender of leishmaniasis patients and control groups (Fig. 2).

**Table 3:** The demographical distribution of the studied groups

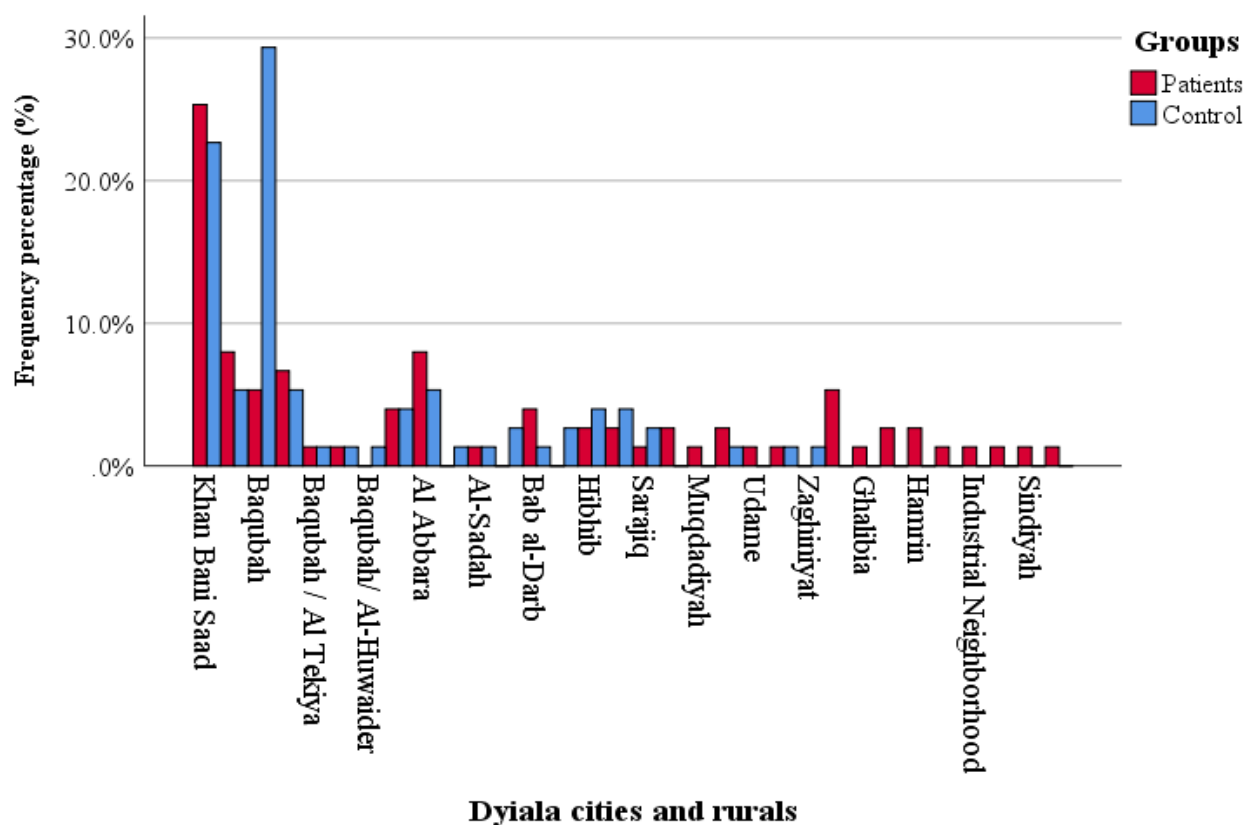
Diyala urbans and rurales	Patients group No. (%)	Control group No. (%)	Probability
Diyala governorate center	13 (17.3)	32 (42.7)	$7.1 \times 10^{-4}$
Suburbs of Diyala governorate	56 (74.7)	40 (53.3)	$6.5 \times 10^{-3}$
Districts of Diyala governorate	6 (8.0)	3 (4.0)	0.302
Total	75 (100.0)	75 (100.0)	



**Studied groups frequency distribution from Diyala urbans and rurals**

**Figure 1:** The demographical distribution of the studied groups





**Figure 2:** Gender distribution of the studied groups

Regarding the frequency of lesion number, the results in table 4 showed that the significantly increased frequency of lesion number was in females compared to males in the single lesion group (59% vs. 41%, respectively), while the males had a significantly increased frequency in the multiple lesion's numbers compared to females (63.89% vs. 36.11%, respectively).

**Table 4:** the frequency percentage of lesions numbers between the patients group gender

Patients group gender	Lesion numbers frequency (%)		Probability
	Single	Multiple	
Males	16 (41.0)	<b>23 (63.89)</b>	<b>0.048</b>
Females	<b>23 (59.0)</b>	13 (36.11)	
Total	39 (100.0)	36 (100.0)	

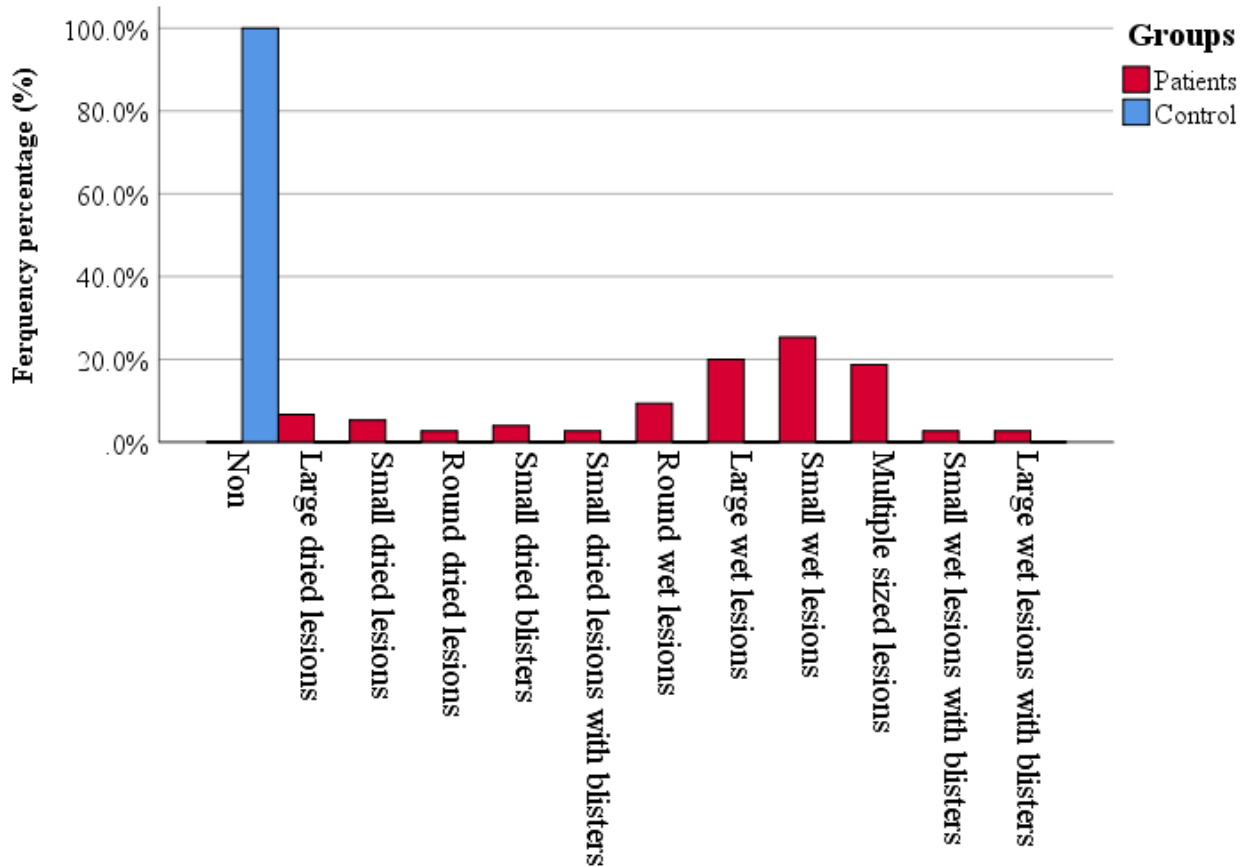


Also, regarding the frequency percentage of lesions' shape, the results in table 5 and Fig. 3 appeared that the non-significant increased frequency percentage was in the patients having small wet lesions (25.3%), and the females had the highest frequency percentage than males (30.6 vs. 20.5). While in the multiple sized lesions, the males have the highest frequency percentage than females (23.1 vs. 13.9) (Table 5).

**Table 5:** The shape of lesions in leishmaniasis patients

Lesions shape	Patients group No. (%)		Total
	Males	Females	
Large dry lesions	3 (7.7)	2 (5.6)	5 (6.7)
Large wet lesions	7 (17.9)	8 (22.2)	15 (20.0)
Small dry lesions	3 (7.7)	1 (2.8)	4 (5.3)
Small wet lesions	<b>8 (20.5)</b>	<b>11 (30.6)</b>	<b>19 (25.3)</b>
Round dry lesions	2 (5.1)	0 (0.0)	2 (2.7)
Round wet lesions	3 (7.7)	4 (11.1)	7 (9.3)
Small dry blisters	1 (2.6)	2 (5.6)	3 (4.0)
Large dry lesions and blisters	1 (2.6)	1 (2.8)	2 (2.7)
Small dry lesions and blisters	1 (2.6)	1 (2.8)	2 (2.7)
Small wet lesions and blisters	1 (2.6)	1 (2.8)	2 (2.7)
Multiple-sized lesions	<b>9 (23.1)</b>	<b>5 (13.9)</b>	14 (18.7)
Total	39 (100.0)	36 (100.0)	75 (100.0)
Probability	0.874		





**Figure 3:** The shape of lesions in leishmaniasis patients

Regarding the lesion location in the body of patients that had a sandfly bite infected with leishmania parasite, the results in table 6 showed that the highest position was in the upper extremities followed by the lower extremities (31% and 20%, respectively), and in females than males in upper and lower extremities groups (50% vs. 33.3 and 27.8% vs. 25.6), while the percentage frequencies distributed from 1% in the neck to 5.3% in the face location.





**Table 6:** The lesion location in the body of patients that had a sandfly bite infected with leishmania parasite

Lesion's location	Patients' group gender frequency (%)		
	Males	Females	Total
Face	1 (2.6)	3 (8.3)	4 (5.3)
Body	0 (0.0)	2 (5.6)	2 (2.7)
Upper extremities	13 (33.3)	18 (50.0)	31 (41.3)
Lower extremities	10 (25.6)	10 (27.8)	20 (26.7)
Neck	1 (2.6)	0 (0.0)	1 (1.3)
Face and neck	1 (2.6)	0 (0.0)	1 (1.3)
Upper and lower extremities	7 (17.9)	3 (8.3)	10 (13.3)
Face and upper extremities	3 (7.7)	0 (0.0)	3 (4.0)
Upper extremities and body	3 (7.7)	0 (0.0)	3 (4.0)
Total	39 (100.0)	36 (100.0)	75 (100.0)

The present findings agreed with previous studies that refer to the increase in the infection frequency percentage of males to females [13, 14, 15]. It is not clear if there is a relationship between gender and the parasite infection, or there are other hormonal or physiological traits, that have a role in increasing this ratio. In addition, the present findings referred to increase the frequency percentage of leishmaniasis infection among Employee compared to those Not-Employee which it can be explained by increased risk of exposure to the vector insect when they be outdoor this agree with Salimi *et al.* [16] who refer that employee and drier and other working people were more infected than unemployed they also refer that males were more infected than female and they explained that the reason for this may be due to the type of cloths. The same findings reported in Iraqi and Arabian previous studied referred to the increasing of males to females' frequency percentage in addition to the high incidence rate of leishmaniasis in Iraqi cities comparing to the neighboring countries [14, 17, 18, 19, 20]. The incidence rate was 45/ 10000 in Alhaweja district [14], while it recorded 15, 5.5 and 2.5 per 10000 in Kirkuk, Samara and Tikrit cities respectively [22, 23]. However, the recent prevalence rate in Iraq, Syria, Saudi Arabia,



Kuwait, Jordan, Lebanon, Yemen, Iran, Algeria, Afghanistan and Peru exceeds the 1.5 million leishmaniasis infection [24]. Also, the present results about the frequency percentage of cutaneous leishmaniasis prevalence rate disagreed with previous Iraqi study, that they reported the increasing frequency percentage of leishmaniasis infection was more frequent in rural than urban. While, the present results referred to increase the leishmaniasis infection among urban than in rural (52.0% vs. 48.0, respectively). In addition, the present results of lesion's numbers, location and shape were partially compatible with Ser and Cetin [25] and Mokni [26]. Also, the present results were compatible with the findings of Asaad *et al.* [27] about the leishmaniasis percentage frequency in Diyala's Urban and Rurales, patients' gender, lesion numbers and locations. There are several factors that contribute to the widespread of leishmaniasis in many Iraqi cities, the electricity supply deficiency was the major factor especially at the night, the lifestyle in the Iraqi rural areas and living in clay houses with no painted indoors, the rodent's presence inside and near the clay houses, animal husbandry (such as chicken, sheep, cows and dogs), etc. All these factors result in an increased frequency percentage of cutaneous leishmaniasis in Iraq, especially in the rural than the urban.

#### 4. Conclusions

In conclusion, the present findings referred that the job type, living's style and position have a main role in the prevalence rate of the disease in rural and urban cities and gender has no role in the etiology of the disease.

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## دراسة ديموغرافية ووبائية لمرضى داء الليشمانيات الجلدي في محافظة ديالى ، العراق

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3. وحدة الأبحاث البايولوجية للمناطق الحارة، كلية العلوم، جامعة بغداد، بغداد، العراق

### المستخلص:

يعد داء الليشمانيات أحد مشاكل الصحة العامة في جميع أنحاء العالم. يزداد خطر الإصابة عند التعرض للدغة ذبابة الرمل الماصة للدم التي تسهل نقل الطفيلي بين مضانف الثدييات، بما فيها الإنسان في حالات قليلة، التي تحمل الشكل أمامي السوط أثناء العدوى. تهدف الدراسة الحالية إلى دراسة العوامل الديموغرافية والوبائية لـ 75 مريضاً مصابين بالليشمانيا الجلدية مقارنة بمجموعة سيطرة صحية متوافقة مع مجموعة المرضى في العمر والجنس والعدد. **النتائج:** أشارت النتائج الحالية إلى وجود ارتفاع غير معنوي في النسبة المئوية للمرضى الموظفين مقارنة بالمرضى المصابين بالليشمانيا الجلدية ولا يمتلكون وظيفة (92.0 % مقابل 8.0 %، على التوالي)، وكذلك لوحظ ارتفاع غير معنوي في النسبة المئوية للإناث مقارنة مع الذكور (97.2 % مقابل 87.2 %، على التوالي)، بينما نتائج مرضى داء الليشمانيات الجلدي غير الموظفين اظهرت وجود ارتفاع غير معنوي في الذكور مقارنة مع الإناث (12.8 % مقابل 2.8 %، على التوالي). بالإضافة إلى ذلك ففي المناطق الحضرية، لم تكن نسبة الإصابة بداء الليشمانيات الجلدي أعلى بكثير في الذكور مقارنة بالإناث (53.8 % مقابل 47.2 %، على التوالي). بينما في المناطق الريفية، كانت النتائج مختلفة. أيضاً، كانت النسبة المئوية لداء الليشمانيات الجلدي أعلى بكثير في منطقة خان بني سعد في محافظة ديالى (25.33 % مقارنة مع المناطق الأخرى التي تراوحت ما بين 0.0 % - 6.67 %، وكانت النسبة المئوية لتكرار ظهور الإصابة عند الإناث أعلى بكثير من الذكور في هذه المنطقة (27.8 % مقابل 23.1 %، على التوالي). أشارت النتائج الحالية إلى أن نوع الوظيفة وأسلوب المعيشة وموقع السكن لهما دور رئيسي في معدل انتشار المرض في المدن الريفية والحضرية وأن الجنس ليس له دور في مسببات المرض.

