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Epidemiological Pattern of Cutaneous Leishmaniasis in Al-Khums City, Libya

A Descriptive Study (2024–2025)

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Abstract

Cutaneous leishmaniasis (CL) is a vector-born parasitic diseaseendemic in many Mediterranean and Middle Eastern regions. This study describes the epidemiological characteristics of CL in Al-Khums City, Libya, between 2024 and 2025. Data from 802 confirmed cases were analyzed according to gender، age, region, and monthly distribution. Males accounted for 61.7% of cases. The most affected age group was 45–54 years (16.2%). Seasonal variationwas marked, with case peaks in December 163 (20.3%)and January 209 (26.0%) . Pearson correlation revealed a strong inverse relationship between monthprogression and CL incidence (r = −0.96, p = 0.001). Al-Amamera, Al-Daawon, and Al-Ma‘qula were identified as major hotspots. Findings highlight significant seasonal and spatial clustering of CL and underscore the need for targeted winter-season vector control.

I - Introduction

Cutaneous leishmaniasis (CL) is a neglected tropical disease caused byprotozoa of the Leishmania species and transmitted by infected femalephlebotomine sandflies (1). Globally, more than one million new CL case occur annually, with substantial regional clustering in the Middle East, North Africa, and the Mediterranean basin (1,2). Although CL rarely leads to

mortality, it causes chronic ulcerative skin lesions, permanent scarring, and social and psychological burdens that significantly impact patients' quality of life (2,8) Libya remains one of the most affected countries in the region, where CL hasbeen historically linked to

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ecological conditions, agricultural activities, and thepresence of animal reservoirs (3,5). Outbreaks in North African countriehave been associated with environmental modifications, urban expansion, and climate-related changes that support sandfly breeding (9,14,15). In the WHO Eastern Mediterranean Region, CL continues to pose a major public healthconcern, with extensive endemicity in rural and peri-urban settings 5,13). Al-Khums City in western Libya constitutes one of the major endemic foci oCL, yet updated epidemiological data remain scarce. Understanding local transmission patterns is critical for designing targeted prevention program (4). This study aims to characterize the epidemiological distribution of CL inAl-Khums during 2024–2025 by analyzing demographic patterns, seasonalvariation, and spatial clustering supported by statistical correlation.

II. Materials and Methods

Study design

A descriptive cross-sectional study covering the period from October 2024 to\April 2025.

Study area

Al-Khums and surrounding districts including Qouqas, Tarhuna, Umm al- Ruthum, Al-Sabah, Al-Mash‘oub, Al-Aqla, Al-Ma‘qula, Al-Amamera, Kaam, Misallatah, Al-Jahawa ,Gharyan, Akleh, Sidi al-Sayah,Sidi Khalifa,Al-Qusai,Ja‘aka and Ben walid .

Data collection

Data were extracted from official clinical records and included: Month of diagnosis Age and gender , Residence area,Monthly distribution by region.

Statistical analysis

Descriptive statistics were applied. Pearson correlation was used to evaluate the relationship between month progression and CL incidence, as recommended for continuous epidemiological variables

III. Results

Demographic characteristics

A total of 802 cases were recorded. Males represented 61.7%, consistent with other regional studies showing higher male exposure to sandfly breading ground . The most affected age group was 45–54 years (16.2%), while children <15 years constituted 23.6%, reflecting intra-domestic or peri-domestic transmission.

Table (1): Distribution of the Sample study by Age and Gender

Age Groups	Males	Percentage	Females	Percentage	Total	Percentage
Under 5 years	34	6.87	15	4.89	49	6.11
5–9 years	38	7.68	26	8.47	64	7.98
10–14 years	48	9.70	28	9.12	76	9.48
15–19 years	67	13.54	16	5.21	83	10.35
20–24 years	32	6.46	32	10.42	64	7.98
25–29 years	25	5.05	18	5.86	43	5.36
30–34 years	31	6.26	14	4.56	45	5.61
35–39 years	36	7.27	27	8.79	63	7.86
40–44 years	37	7.47	26	8.47	63	7.86
45–54 years	72	14.55	58	18.89	130	16.21
55–59 years	26	5.25	12	3.91	38	4.74
60–64 years	14	2.83	6	1.95	20	2.49
65–69 years	15	3.03	10	3.26	25	3.12
70 years and above	20	4.04	19	6.19	39	4.86
Total	**495**	**100%**	**307**	**100%**	**802**	**100%**

Figure (1): Distribution of the Sample study by Age and Gender

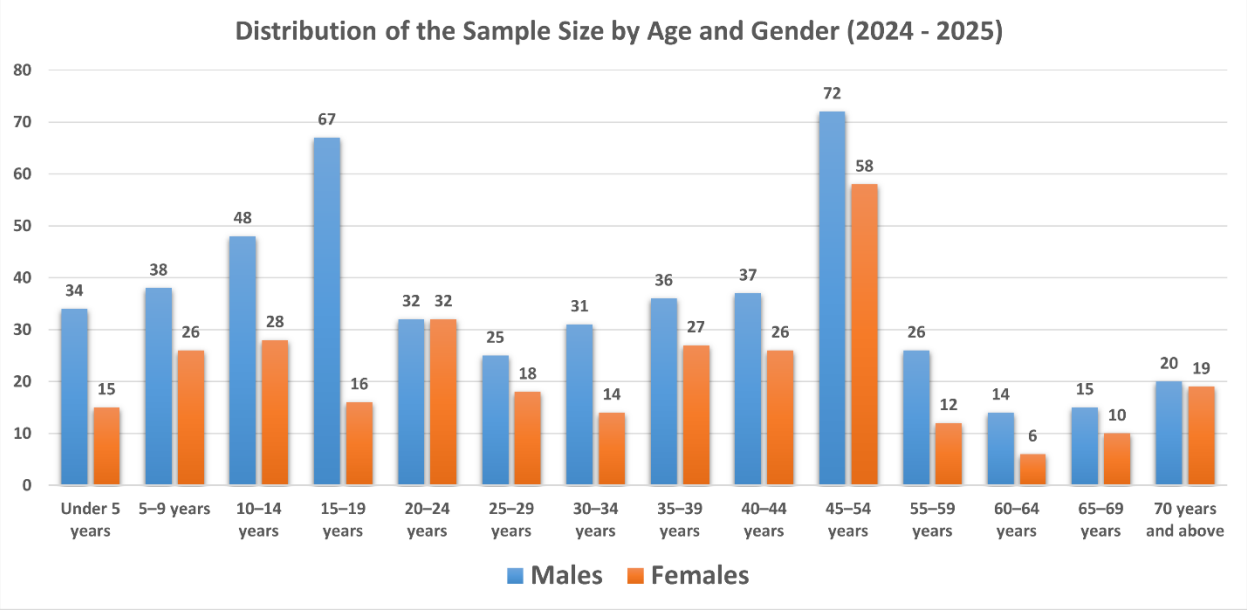

Figure (1): Distribution of the Sample study by Age and Gender

The results of Table and Figure (1) indicate that the total number of cutaneous leishmaniasis cases reached 802 during the year 2024–2025, with males accounting for the majority at

61.7% compared to 38.3% for females. The cases were distributed across different age groups, with the highest percentage recorded in the 45–54 age group (16.2%), followed by the 15–19 years (10.4%) and 10–14 years(9.5%) groups. Children under 15 years constituted about 23.6% of the total cases, indicating that the disease is not limited to adults. Overall, the active age groups (15–54 years) emerged as the most vulnerable, while lower rates were observed among the elderly, reflecting the relationship of the disease with environmental exposure and daily activities.

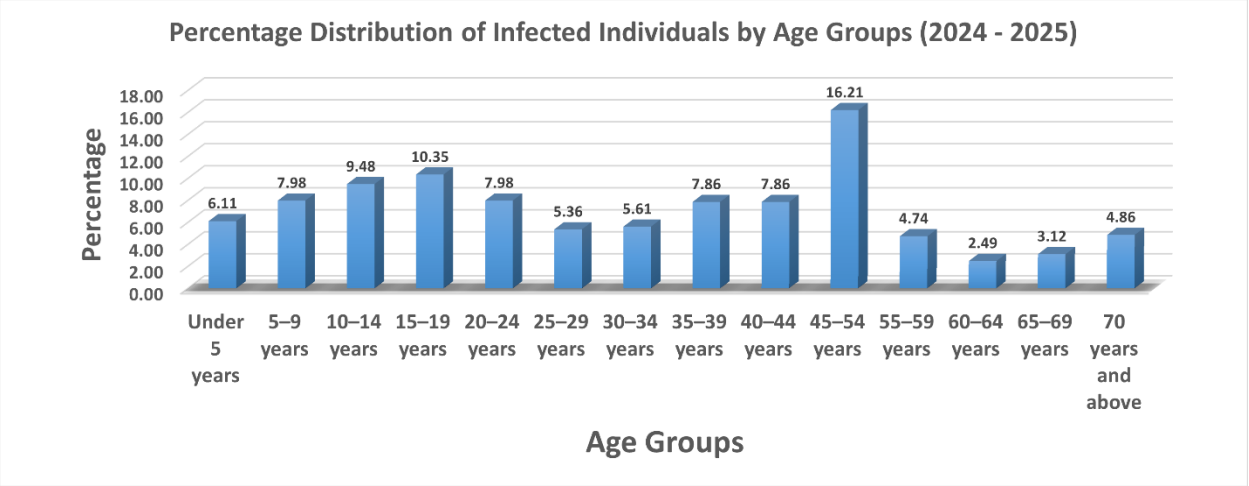

Figure (2): Percentage Distribution of Infected Individuals by Age Groups

Table (2): Distribution of Leishmaniasis Cases by Regions and Months during the period (2025–2024)

Months	October 2024	November 2024	December 2024	January 2025	February 2025	Marce 2025	April 2025
Qouqas	21	14	12	1	2	3	1
Tarhuna	2	2	0	8	0	0	0
Umm al-Ruthum	17	6	8	3	0	0	0
Al-Sabah	5	5	6	2	1	0	0
Al-Mash‘oub	3	7	7	10	4	0	0
Al-‘Aqla	3	0	3	3	0	0	0
Al-Ma‘qula	20	8	15	8	11	2	2
Al-Amamera	18	11	41	42	36	2	3
Al-Hammam	1	0	2	4	1	2	1
Kaam	12	6	17	28	18	9	0
Misallatah	10	10	10	8	10	1	1
Targulat	8	3	3	0	1	0	0
Al-Qarara	3	0	1	2	3	0	0
Lebda	1	0	0	0	1	2	0
Al-Zawaid	4	1	2	0	0	0	0

Months	October 2024	November 2024	December 2024	January 2025	February 2025	Marce 2025	April 2025
Al-Daawon	8	8	14	42	11	2	1
Souq al-Jum‘a (Zliten)	8	1	13	15	5	1	1
Bandar	0	3	7	11	5	7	3
Al-Jahawat	0	1	6	11	5	1	3
Bani Walid	0	2	2	0	0	0	0
Ja‘aka	0	0	2	5	0	1	1
Sidi al-Sayd	0	0	0	7	3	0	0
Sidi Khalifa	0	0	0	5	3	0	0
Al-Qusai	3	1	0	0	0	0	0
Sidi al-Sayah	2	0	1	0	0	0	0
Al-Khadra	6	2	6	0	2	0	0
Akleh	1	0	1	5	3	0	0
Misurata	0	2	0	0	0	0	0
Gharyan	0	0	3	2	0	1	2

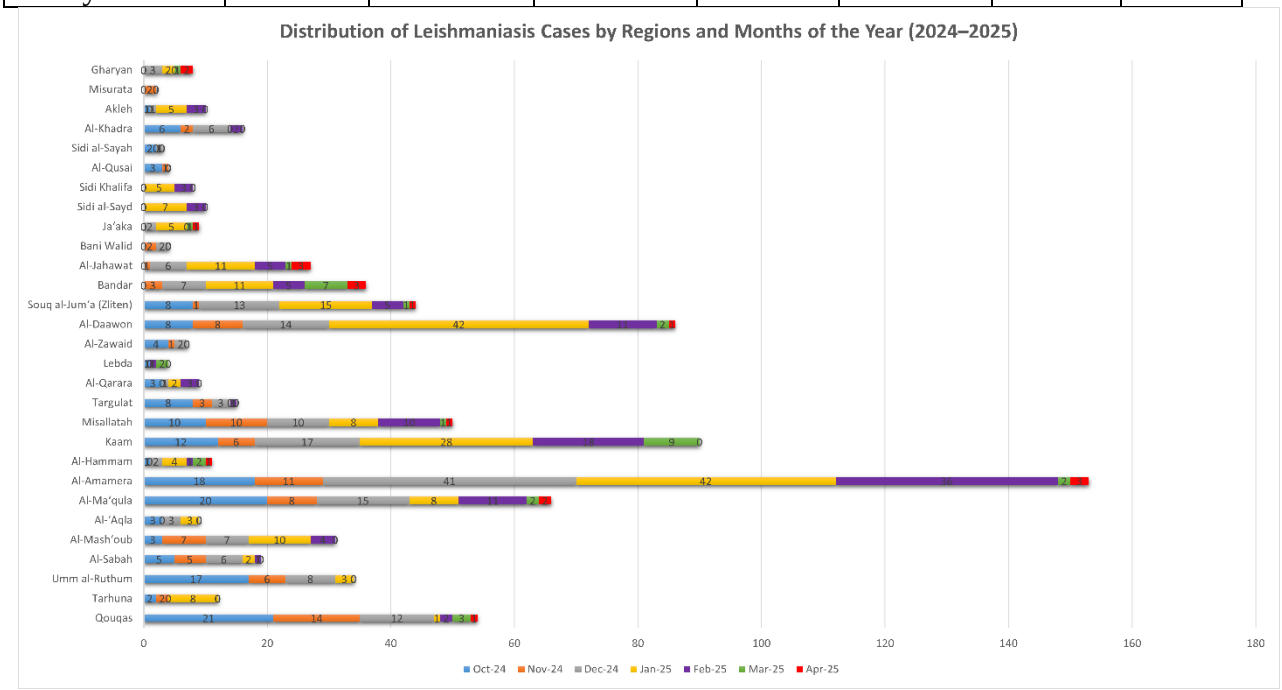

Figure (2): Distribution of Leishmaniasis Cases by Regions and Months during the period (2024–2025)

The monthly distribution of cutaneous leishmaniasis cases revealed a clear concentration during the winter season. In December 2024, about 163 cases were recorded, increasing to 209 cases in January 2025, before declining to 120 cases in February of the same year. This trend reflects the seasonal pattern of the disease, as the activity of the sandfly vector increases during cold and humid periods, while cases gradually decreased in March (29 cases) and April (12 cases) with rising temperatures.

In terms of spatial distribution, the results showed that certain regions serve as primary foci of the disease. Al-Amamera reported the highest incidence (41 cases in December and 42 in January), followed by Al-Daawon and Al-Ma‘qula, which also recorded high numbers during the same period. Moderate infection levels were observed in regions such as Qouqas, Tarhuna, Umm al-Ruthum, Al-‘Aqla, and Al-Mash‘oub, while markedly lower levels were reported in areas like Gharyan, Misurata, Al-Khadra, and Sidi al-Sayah.

Overall, the findings demonstrate that the spread of the disease is heterogeneous, with cases clustering in specific regions that can be considered hotspots. This may be associated with environmental factors such as land characteristics and the presence of farms or animal shelters suitable for sandfly breeding. These disparities highlight the importance of directing preventive efforts and control programs particularly toward high-risk areas, especially at the beginning of the winter season, to mitigate disease transmission.

IV. Discussion

The present study reinforces the endemic nature of CL in Al-Khums andhighlights demographic, seasonal, and spatial determinants of disease transmission. The predominance of male cases is consistent with findings from Iraq, Algeria, and Tunisia, where occupational exposure and outdoor evening activities elevate risk (3,7,10). Adult males working in agriculture or livestock handling are more likely to encounter sandfly vectors (12,15). The concentration of cases among individuals aged 45–54 may reflect occupational and behavioral factors unique to this demographic. Meanwhile, the substantial proportion of children infected corresponds with observationsthat sandflies often breed near households, enabling indoor or peri-domestictransmission (1,9). Seasonal trends closely fit the biological characteristics of Phlebotomussandflies, which prefer humid and moderately cool climates (2,5,14). The peakin winter months followed by a decline in early spring matches patternspreviously observed in Mediterranean countries such as Tunisia, Morocco, and Cyprus (4,8,9). Spatial clustering in Al-Amamera, Al-Daawon, and Al-Ma‘qula suggests environmental suitability for both sandfly vectors and animal reservoirs such as rodents and dogs (12,14,17). Addressing these hotspots requires geographically targeted intervention strategies rather than city-widemeasures. The strong negative correlation ($r = -0.96$) supports prior findings showing that temperature rise and humidity decline significantly lower sandfly activity (13,15). These results highlight the importance of implementing vector controlprograms before and during early winter, when transmission risk is highest.

V. Conclusion

CL in Al-Khums exhibits clear epidemiological patterns shaped by demographic characteristics, climatic cycles, and localized environmenta conditions. The study underscores the necessity of targeted vector control public awareness campaigns, and improved diagnostic surveillance, especially in high-risk regions and during winter months.

VI. Recommendations

Implement winter-focused integrated vector management Launch targeted interventions in identified hotspots Improve rodent control and environmental sanitation Strengthen community awareness programs Enhance laboratory diagnosis and surveillan Conduct molecular studies to identify circulating Leishmania species

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النمط الوبائي لمرض اللشمانيا الجلدية بمدينة الخمس، ليبيا دراسة وصفية (2024–2025)

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الكلمات المفتاحية:
Cutaneous Leishmaniasis; Vector ; Sandflie ; Tropical disease(

الملخص

تعدّ اللشمانيا الجلدية من الأمراض الطفيلية المنقولة بواسطة ذبابة الرمل، وهي متوطنة في العديد من المناطق في دول حوض البحر المتوسط والشرق الأوسط. تهدف هذه الدراسة إلى وصف الخصائص الوبائية لحالات اللشمانيا الجلدية المسجلة في مدينة الخمس، ليبيا، خلال الفترة من عام 2024 إلى 2025. تم تحليل بيانات 802 حالة مؤكدة وفقًا للجنس والفئة العمرية والمنطقة الجغرافية والتوزيع الشهري.

أظهرت النتائج أن الفئة العمرية الأكثر إصابة كانت 45–54 سنة (16.2%)، وأن نسبة الذكور كانت 61.7% من مجموع الحالات. كما لوحظت ان اعلى نسبة للإصابات كانت خلال ديسمبر 163 حالة (**20.3%**) و يناير 209 (26.0%) حالات، مما يشير إلى نمط موسمي للمرض. وكشف تحليل الارتباط (بيرسون) عن علاقة عكسية قوية بين تقدم الأشهر وحدوث الحالات (**r = -0.956, p < 0.001**). كما تم تحديد مناطق العمامرة ، الداوون، والغويلات بوصفها بؤراً رئيسية لتجمع الإصابات.

تؤكد هذه النتائج وجود تكتلات مكانية وزمانية مهمة للمرض، وتبرز الحاجة إلى استراتيجيات موجهة لمكافحة الناقل ، بالإضافة إلى تحسين برامج المراقبة والتوعية الصحية.