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Treatment characteristics, outcomes, and safety for cutaneous leishmaniasis in Colombian adults aged over 44 years between 2011 and 2023

Liliana López-Carvajal[1]✉, Isabela Villegas-Cano[2], Valeria Ríos-Ruiz[2], Esteban Soto-Ramírez[1], Jaiberth Antonio Cardona-Arias[2]

[1]*Grupo de Investigación Clínica PECET, GIC-PECET, Universidad de Antioquia, Colombia*

[2]*Escuela de Microbiología, Universidad de Antioquia, Colombia*

ABSTRACT

Objective: To describe the effectiveness and safety of treatment for cutaneous leishmaniasis in patients over the age of 44 years treated at a specialized research center in Colombia.

Methods: Clinical profiles of cutaneous leishmaniasis patients were retrospectively described and effectiveness and safety of systemic and local and systemic treatments were compared with Pearson's *Chi*-square test or Fisher's exact test.

Results: A total of 151 patients were included and 65% were male, 78% were over 50 years of age, 28% had hypertension and 11% had diabetes. The main treatments were systemic glucantime (10%), miltefosine (15%), and local treatments (48%). Treatment effectiveness was 68% for systemic and 64% for local treatments. Patients on systemic treatments had a significantly higher frequency of systemic adverse events. In contrast, those on local treatments only showed a statistically higher proportion of vesicles in application site.

Conclusions: Our findings show moderate effectiveness across treatments. Crucially, while systemic and local treatments had similar effectiveness, systemic treatments were associated with a significantly higher frequency of adverse events. This finding highlights that local therapies offer a safer alternative for older adults, making them a viable and potentially preferable first-line option to minimize toxicity in this vulnerable population.

KEYWORDS: Cutaneous leishmaniasis; Treatment; Older adult; Effectiveness; Safety

1. Introduction

Leishmaniasis is a chronic disease caused by a protozoan belonging to the *Leishmania* genus, for which more than 20 species have been identified worldwide, transmitted through sandfly vectors representing around 90 species[1]. In Colombia, according to the National Institute of Health, there are around 6 100 cases of cutaneous leishmaniasis per year, and the country has a wide variety

Summary

Question: What is the effectiveness and safety profile of the different treatments for cutaneous leishmaniasis in patients over 44 years of age?

Findings: In this retrospective cohort study of 151 patients, the majority were male (65%) with significant comorbidities (28%) like hypertension and diabetes. Local treatments were used in 48% of cases and demonstrated effectiveness comparable to systemic therapies, with no statistically significant differences in healing rates.

Meaning: Local treatments represent a viable and safe therapeutic primary alternative for older adults with cutaneous leishmaniasis, especially those with pre-existing health conditions.

✉To whom correspondence may be addressed. E-mail: liliana.lopez@pecet-colombia.org

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of *Leishmania* and sand fly species[2]. Transmission is related to outdoor activities such as agriculture, livestock farming, mining, construction, and tourism, as well as poor housing conditions[3].

In the Americas, the disease manifests in three clinical forms: cutaneous, mucocutaneous, and visceral. The cutaneous form is the most prevalent. Cutaneous leishmaniasis can be classified as localized, with a predominance of local ulcers; disseminated, characterized by multiple papular lesions in different body segments; or diffuse, with a predominance of numerous nodules and plaques[4]. Typically, cutaneous leishmaniasis manifests as an ulcer that can heal spontaneously in some patients within 3 to 18 months. It can also cause scarring, but in general, its clinical course depends on the virulence of the causative species and the host's response[1,5].

Colombian health authorities have issued guidelines for the management of leishmaniasis, recommending systemic alternatives such as pentavalent antimonials, miltefosine, pentamidine isethionate, and liposomal amphotericin B or deoxycholate, as well as local alternatives including thermotherapy and intralesional pentavalent antimonials[6]. Among these recommendations, systemic pentavalent antimony compounds and miltefosine have been identified as those with high-quality evidence and a strong recommendation in favor[6]. Although these last two options have acceptable efficacy, there are documented safety issues associated with them[7], a situation that makes their use difficult in older people and/or those with comorbidities that can exacerbate the toxicity problems of the therapies, with local therapeutic alternatives being a recommended option for this type of population.

Although the disease is concentrated in the young adult population[8], it is important to understand the clinical profile of cutaneous leishmaniasis in the population over 44 years old, where safety considerations associated with the use of systemic medications become more important. However, few clinical studies disaggregate their findings by age group, so there are not many publications on the clinical profile of adult patients[9]. It is important to note that, in most cases, the older adult population (mainly those over 60 years of age) is not eligible to participate in clinical studies evaluating therapeutic alternatives. This is why the incorporation of real-world evidence research techniques plays a leading role in determining the safety and effectiveness of different therapeutic alternatives, mainly local ones, for the management of cutaneous leishmaniasis and medical decision-making, epidemiological surveillance, and public health in general[10].

Therefore, the objective of this study was to describe the effectiveness and safety of treatment for cutaneous leishmaniasis in patients over the age of 44 treated at a specialized research center in Colombia.

2. Methods

2.1. Study design and population

An observational study was conducted on a retrospective cohort of 151 adults diagnosed with cutaneous leishmaniasis who met the following eligibility criteria: men or women over 44 years of age, with a confirmed diagnosis of cutaneous leishmaniasis, who accepted treatment at a referral center for disease management, and who voluntarily agreed to the use of their clinical information for research purposes. All cases of cutaneous leishmaniasis were analyzed; therefore, no sample size or sampling was estimated.

2.2. Data collection

A secondary source of information was used, consisting of the medical records of patients who met the eligibility criteria. These records were completed by medical researchers who were experts in the management of the disease. The records encompassed a range of data, including sociodemographic variables, medical evaluations, laboratory test results, treatment modalities, and clinical outcomes.

The diagnosis of cutaneous leishmaniasis was made by confirming the presence of the parasite using one of the following methods: direct examination, parasite culture, biopsy, and/or PCR[11,12]. To harmonize the information, the results of the therapeutic response were defined based on the guidelines established by the Pan American Health Organization (PAHO), as follows:

Cure: Complete re-epithelialization and flattening of the edges of the lesions, disappearance of induration at the base, disappearance of lymphangitis or adenitis if present, and absence of new lesions 3 months after completion of treatment. Reactivation: Failure to heal or worsening of a lesion that had clinically improved. Relapse: Reappearance of a lesion that had been previously cured. Therapeutic failure: No improvement after complete treatment. Clinical improvement: Patient who showed improvement in lesions at the end of treatment and up to 45 days after treatment but did not complete the 3-month follow-up. Reinfection: The development of new lesions in anatomical areas other than those previously cured, associated with a history of recent exposure to the parasite in endemic areas[4]. The follow-up protocol at the research center is: start, middle, and end of treatment; and days 45, 90, 180, and 365 post-treatment. Initial cure or failure is normally determined by day 90.

2.3. Control of bias

Selection bias was controlled by rigorously applying eligibility criteria. To mitigate the risk of information bias, diagnostic techniques

were performed according to the manufacturer's specifications and with appropriate controls. Diagnostics were performed in laboratories with high quality standards, clinical information was collected by a research physician with specialized training in leishmaniasis, and the quality of diagnostic samples was ensured. In the secondary source, logical verification and double checking of the study group data were performed. The evaluation of the side effects of the different treatment alternatives was performed according to the Common Terminology Criteria for Adverse Events v.5 (CTCAE)[13].

2.4. Statistical analysis

A univariate analysis was performed to describe the sociodemographic characteristics of the study population. Absolute (number) and relative frequencies (%) were used for qualitative variables, and summary measures (mean, standard deviation, median, and interquartile range) were used for quantitative variables. To compare the effectiveness and safety results by treatment type (local or systemic), we used Pearson's *Chi*-square test for nominal variables and Fisher's exact test when the expected frequency was less than five. All analyses were performed using SPSS 29.0 statistical software, considering a significance level of less than 0.05.

2.5. Ethical considerations

The guidelines of the Declaration of Helsinki and Resolution 8430 of 1993 of the Colombian Ministry of Health were followed, according to which this research corresponds to a risk-free study since it is based on documentary data. In addition, the confidentiality of the participants' identification data was guaranteed, and only the healthcare team involved in the study had access to the information.

All participants signed the informed consent form and approved the use of their clinical data for research purposes. The principles of autonomy, beneficence, non-maleficence, and justice were respected. The data analyzed were obtained from the medical records of older adults attended at PECET, and in accordance with the provisions of Colombian resolution 1995 of 1999, which establishes standards for the management of medical records, the use of the data contained in them is permitted for healthcare personnel. The different versions of the ICF had been approved by the safety committee of the site.

3. Results

A total of 151 records of patients over 44 years of age were analyzed. The majority of patients came from Antioquia (68.9%), were male (64.9%), over 50 years of age (78.1%), and were housewives (24.5%) or self-employed (17.2%). In terms of comorbidities, 41.7% reported pre-existing conditions, with hypertension (28.5%) and diabetes mellitus (10.6%) being the most prevalent. The percentage of people who did not report a history of leishmaniasis was 74.2%. In terms of previous treatment, the most commonly reported was the use of glucantime (Table 1).

Table 1. Demographic, clinical, and treatment characteristics (n=151).

Variables		n (%)
Province of origin	Antioquia	104 (68.9)
	Chocó	21 (13.9)
	Caldas	6 (4.0)
	Santander	5 (3.3)
	Córdoba	4 (2.6)
	Boyacá	2 (1.3)
	Tolima	2 (1.3)
	Caquetá	2 (1.3)
	Others[a]	5 (3.3)
Sex	Female	53 (35.1)
	Male	98 (64.9)
Age, years		57 (45-91)[#]
	45-50	33 (21.9)
	51-64	75 (49.7)
	Over 64	43 (28.5)
Ocuppation	No data	20 (13.2)
	Housewife	37 (24.5)
	Self-employed/Merchant	26 (17.2)
	Professional	14 (9.3)
	Technician/Technologist	4 (2.6)
	Farmer	24 (15.9)
	Other	26 (17.2)
Comorbidities	No	88 (58.3)
	Yes	63 (41.7)
	Hypertension	43 (28.5)
	Diabetes mellitus	16 (10.6)
	Dyslipidemia	6 (4.0)
	Heart disease	4 (2.6)
	Obesity	3 (2.0)
	Hypothyroidism	3 (2.0)
	Asthma	2 (1.3)
	Other[b]	9 (6.0)
Previous infection with leishmaniasis	No	112 (74.2)
	Yes	21 (13.9)
	No data	18 (11.9)
Previous treatment	No	135 (89.4)
	Yes	16 (10.6)
	Systemic glucantime	8 (5.3)
	Intralesional glucantime	3 (2.0)
	Miltefosine	3 (2.0)
	Traditional medicine	1 (0.7)
	Topic under investigation	1 (0.7)
Current infection	No data	18 (11.9)
	Primary infection	113 (74.8)
	Reinfection	10 (6.6)
	Reactivation	3 (2.0)
	Failure	7 (4.6)
Treatment	Intralesional glucantime	37 (24.5)
	Systemic glucantime	15 (9.9)
	Topic under investigation	22 (14.6)
	Thermotherapy	13 (8.6)
	Miltefosine	22 (14.6)
	Pentamidine	7 (4.6)
	Combined	3 (2.0)
	No data[c]	32 (21.2)

Table 1 continues in the next page.

Table 1. Continued.

Variables		*n* (%)
Type of lesion	Ulcer	116 (89.2)
	Papule	11 (8.5)
	Nodule	10 (7.7)
	Crusted	10 (7.7)
	Verrucous	9 (6.9)
Quantitative variables[#]	Weeks of evolution	8 (4-16)
	Number of lesions	1 (1-2)
	Head or neck lesions	0 (0-1)
	Trunk lesions	0 (0-0)
	Upper limb lesions	1 (0-1)
	Lower limb lesions	0 (0-1)

Data were expressed as *n* (%) unless otherwise indicated; [#]data expressed as median (range); [a]One case from each of the following departments: Guajira, Magdalena, Meta, Nariño, and Putumayo; [b]One case from each of the following: cerebral aneurysm, gout, kidney loss, kidney disease, gastroesophageal reflux, anemia, cancer, psoriasis, allergic rhinitis; [c]patients were diagnosed at a referral center but did not continue treatment there; [#]Data were expressed as median (IQR).

Most of the patients (74.8%) had a primary infection, and the most common type of lesion was an ulcer (89.2%). Regarding treatment, intralesional therapy with glucantime was the most commonly used (24.5%), followed by miltefosine (14.6%) and investigational topical agents (14.6%). Reinfections and treatment failures were low (6.6% and 4.6%, respectively). The median duration of the disease was 8 (IQR: 4-16) weeks on average, and the median number of lesions per patient was 1 (IQR: 1-2), but the range was variable (range: 1 to 25); most lesions were located on the extremities (Table 1).

The effectiveness of the treatment was 68.2% in systemic treatments and 63.9% in local treatments. The healing time showed great variability, with a median of 62 days (IQR: 30-121, range: 0-551 days). No differences were found between the median healing time among patients who received local, systemic, and combined treatments (Log rank test *P*-value: 0.875) (Figure 1).

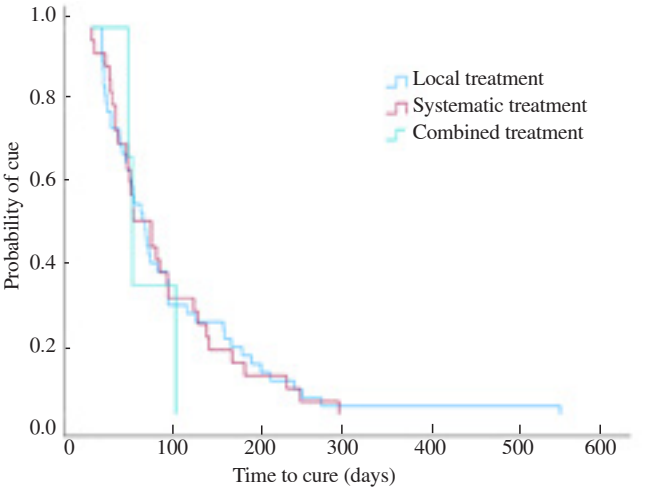

Figure 1. Healing time according to treatments.

With regard to adverse events, patients receiving systemic treatments experienced a statistically higher frequency of myalgia and/or arthralgia, nausea and vomiting, and fever, chills, and/or headache than those receiving local treatments, while in the latter group only the proportion of vesicles was statistically higher (Table 2).

4. Discussion

In accordance with the guidelines for the management of

Table 2. Effectiveness and safety according to type of treatment.

Effects			Local (*n*=72)	Systemic (*n*=44)	Fisher's *P*-value
Outcome		Cure	46 (63.9)	30 (68.2)	0.637[*]
		Therapeutic failure	5 (6.9)	1 (2.3)	0.260
		Clinical improvement	13 (18.1)	8 (18.2)	0.986[*]
		Loss of follow-up	7 (9.7)	5 (11.4)	0.778[*]
Safety	Adverse effects at the onset of treatment	Myalgia and/or arthralgia	0 (0.0)	6 (13.6)	0.002
		Nausea and/or vomiting	0 (0.0)	4 (9.1)	0.019
		Fever, chills, and/or headache	1 (1.4)	4 (9.1)	0.068
		Vesicles	6 (8.3)	0 (0.0)	0.049
		Erythema	3 (4.2)	1 (2.3)	0.510
		Edema	4 (5.6)	0 (0.0)	0.144
		Local pain	3 (4.2)	0 (0.0)	0.235
		Others	1 (1.4)	6 (13.6)	0.012
	Adverse events during treatment	Myalgia and/or arthralgia	0 (0.0)	7 (15.9)	<0.001
		Nausea and/or vomiting	0 (0.0)	3 (6.8)	0.052
		Fever, chills, and/or headache	1 (1.4)	0 (0.0)	0.621
		Vesicles	1 (1.4)	0 (0.0)	0.621
		Erythema	1 (1.4)	0 (0.0)	0.621
		Edema	2 (2.8)	0 (0.0)	0.383
		Local pain	3 (4.2)	0 (0.0)	0.235
		Others	4 (5.6)	3 (6.8)	0.537
	Adverse events at the end of treatment	Fever, chills, and/or headache	0 (0.0)	4 (9.1)	0.019
		Myalgia and/or arthralgia	0 (0.0)	1 (2.3)	0.379
		Nausea and/or vomiting	0 (0.0)	1 (2.3)	0.379
		Others	2 (2.8)	2 (4.5)	0.490

[*]Pearson's *Chi*-square test.

leishmaniasis issued by the Colombian Ministry of Health, this study included patients aged 45 years and older, as it is in this population that intensified clinical and paraclinical follow-up is recommended for monitoring the safety profile of treatments[6]. Most patients came from Antioquia, similarly to study of Ramírez *et al*., who reported a higher number of cutaneous leishmaniasis cases in that department, although Cundinamarca and Santander also recorded high numbers[14]. Although this finding can be explained by the location of the research center, it is important to determine whether this behavior is related to geographical, environmental, and socioeconomic factors, which may indicate the need to improve epidemiological surveillance strategies in Antioquia and implement programs to mitigate the risk of transmission.

The predominance of cutaneous leishmaniasis in men has been reported in several studies[14,15]. This pattern could be related to differences in behavior and occupational exposure linked to outdoor activities, which increase the likelihood of contact with infected vectors. While housewife (24.5%) and self-employed (17%) occupations were more prevalent in this study, previous research has highlighted activities more closely related to agriculture. Such is the case of Yizengaw *et al*. and Hernández *et al*., who in their respective studies identified agricultural and mining workers as the most affected population group, concluding that: deforestation related to these activities is associated with a higher number of reported cases of cutaneous leishmaniasis in Colombia and with changes in the dynamics of disease transmission, which means that all age groups and sex are affected by cutaneous leishmaniasis[16-18]. This underscores the importance of implementing preventive and educational strategies that involve the entire population, taking into account the interaction of environmental and social factors that facilitate its transmission. In this study, hypertension was the most common comorbidity, followed by diabetes mellitus, which is consistent with the findings reported by Castro *et al*.[9]. For the population included in this study, this can be explained by the aging process, which leads to physiological changes such as decreased kidney function, arterial stiffness, hormonal changes (mainly in women), and decreased insulin sensitivity, as well as cumulative lifestyle factors (a diet high in sodium, saturated fats, and sugars, sedentary lifestyle, obesity, tobacco and alcohol consumption) and genetic factors that, either individually or in combination, make the older adult population more susceptible to these types of conditions[19,20].

On the other hand, the presence of these comorbidities impairs the patient's immune capacity, making them even more susceptible to disease and hindering their recovery. For example, it has been reported that diabetes mellitus reduces the ability of neutrophils to eliminate infectious agents, and in patients with cutaneous leishmaniasis, it is associated with atypical lesions, characterized by flat and diffuse ulcers, which tend to have lower healing rates than typical lesions[21]. Therefore, specific clinical monitoring actions should be developed for patients with comorbidities, and research should be conducted on how these comorbidities impact certain clinical outcomes in cutaneous leishmaniasis.

The high prevalence of ulcerative lesions (89%) observed in this study and their location in the extremities is consistent with the findings of Melo *et al*., In addition to the above, they reported that most patients present with a single lesion[3]. It can be inferred that this is a consequence of the fact that the extremities are more exposed during work or recreational activities in rural areas. Therefore, some preventive actions could be suggested to reduce exposure in this part of the body, in addition to education about the risks of exposure in rural activities.

The effectiveness of systemic treatment (68%) and local treatment (64%) was comparable, which aligns with the findings of previous studies that documented 73% efficacy for thermotherapy and 71% for systemic treatments based on antimonials[22]. However, other studies have reported higher cure rates for these treatments, around 93% for local and between 84%-100% for systemic[23]. A review of cryotherapy found an effectiveness rate of 67%, which increased to 91% when combined with intralesional glucantime and 89% with intralesional meglumine gene therapy[24]. The above illustrates the heterogeneity of cure rates across different populations, emphasizing the necessity of understanding the specific profile of each group studied. It also highlights the importance of selecting appropriate systemic or local treatments, taking into account the profile of adverse effects and the individual characteristics of the patient. With regard to time, no difference was found between patients treated with local and systemic treatments, an aspect that favors non-invasive therapeutic alternatives.

Some adverse effects of systemic treatments, such as myalgias and arthralgias, showed a higher frequency, especially during treatment (47%)[25]. Previous studies, such as that of Castro *et al*. observed similar side effects when using systemic antimonials, where musculoskeletal and connective tissue manifestations predominated, followed by nervous system symptoms[9]. On the other hand, a systematic review that evaluated local therapies found side effects similar to the current study such as redness/erythema, pain, itching, burning, edema, vesicles (in the case of thermotherapy) and hyper- or hypopigmentation, and also highlighted that low rates of relapse and recurrence were reported[26]. This shows that systemic treatments are associated with mostly musculoskeletal adverse effects, so their use should be restricted to complicated cases that do not respond to topical treatments, immunocompromised patients and those with a suspected higher risk of progression to more severe forms of leishmaniasis[26]. In contrast, local treatments produce adverse effects that disappear in about two weeks after the end of treatment, so it could be suggested as a first option when the benefit for the patient outweighs the risks[26] or to implement combined options where the treatment schedules of the systemic alternatives are shorter in order to minimize side effects and increase effectiveness.

It is essential to evaluate the effectiveness and safety of treatments in adult patients, due to the heterogeneity in clinical response in this population, which is influenced by the prevalence of comorbidities and previous conditions[9]. These manifestations can

have a significant impact on the progression of the disease and the clinical outcomes, including the length of time to achieve a cure and the possibility of therapeutic failure[21]. As demonstrated in this research, the effectiveness rates of systemic and local treatments are comparable. However, systemic alternatives have a significantly worse safety profile. This, in conjunction with the higher prevalence of comorbidities in this population group, could potentially compromise the efficacy of systemic alternatives and exacerbate their safety concerns.

Among the main limitations of the study is the loss of data, a situation inherent to this type of research, and the absence of follow-up of clinical outcomes in most of the subjects at least 12 weeks after the end of treatment limits the information regarding relapses. However, it would be expected that if relapses had occurred, patients would have come to the center for care. Major strengths include the large sample size, the thoroughness of the clinical evaluation of patients, and the identification and follow-up of treatment side effects. Other limitation of this study is that the identification of *Leishmania* parasite was limited to the genus level; although species identification is not imperative to initiate treatment[4], having this information could facilitate the interpretation of the results and contribute to the understanding of local epidemiology and transmission patterns.

Although progress has been made in the understanding of cutaneous leishmaniasis in adults, there are still areas to be explored to improve its prevention, diagnosis, treatment and clinical monitoring. This takes on greater importance when considering the increase in the rates of therapeutic failure due to parasitic resistance or immunosuppression, as well as the low coverage of preventive measures and the low recognition of this disease in some populations[27].

Additionally, it is crucial to emphasize that cutaneous leishmaniasis poses a substantial challenge to the Colombian healthcare system due to its high incidence, the physical and psychological sequelae it causes in patients, and the barriers to healthcare access that populations at greater risk of infection may encounter. Despite institutional efforts, there are still limitations in the clinical characterization of the disease, especially in older adults. This hinders medical, epidemiological surveillance, and public health decision-making in general.

Finally, in terms of therapeutic management, although systemic and local treatments show similar efficacy for cutaneous leishmaniasis in older adults, systemic treatments are associated with a significantly higher number of adverse events. This suggests that local therapies may be a safer and potentially preferable first-line option for this vulnerable population in order to minimize toxicity, especially given the high prevalence of comorbidities such as hypertension and diabetes. The findings support the use of real-world evidence to guide treatment decisions in groups that are often underrepresented in traditional clinical trials.

In conclusion, our findings show moderate effectiveness across treatments. Crucially, while systemic and local treatments had similar effectiveness, systemic treatments were associated with a significantly higher frequency of adverse events. This finding highlights that local therapies offer a safer alternative for older adults, making them a viable and potentially preferable first-line option to minimize toxicity in this vulnerable population.

Conflict of interest statement

All authors declare there is no conflict of interest.

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Authors' contributions

LLC and ESR participated in the conceptualization and design of the work; ESR participated in the data collection; LLC, IVC, VRR and JACA participated in the validation; LLC, IVC, VRR and JACA participated in the formal analysis and interpretation; ESR, IVC, VRR and JACA participated in the data curation; LLC, IVC, VRR and JACA participated in the writing—original draft preparation; LLC, IVC, VRR, ESR and JACA participated in the writing—review and editing, and LLC participated in the supervision. All authors have read and agreed to the final version of the manuscript.

References

[1] Hidalgo Solís MJ, Víquez Redondo KF, Barrantes Valverde SM. Leishmaniasis cutánea. *Rev Med Sinerg* 2021; **6**(5): e674. doi: https://doi.org/10.31434/rms.v6i5.674.

[2] Instituto Nacional de Salud. *Protocolo de Vigilancia en Salud Pública de Leishmaniasis. Versión 5.* [Online]. Available from: https://www.ins.gov.co/buscador-eventos/Lineamientos/Pro_Leishmaniasis.pdf. [Accessed on 10 April 2024].

[3] Melo MGN, Morais RCS, Goes TC, Silva RPE, Morais RF, Guerra Já, et al. Clinical and epidemiological profiles of patients with American cutaneous leishmaniasis from the states of Pernambuco and Amazonas, Brazil. *Rev Soc Bras Med Trop* 2020; **53**: e20200083. doi: https://doi.org/10.1590/0037-8682-0083-2020.

[4] Organización Panamericana de la Salud. *Manual de procedimientos para la vigilancia y el control de las leishmaniasis en la Región de las Américas*. Washington, D.C: OPS; 2023. doi: https://doi.org/10.37774/9789275327340.

[5] Ortega-Moreno ME, Terán-Ángel GA, Hernández MM, Belizario D, Galindo W, Guevara JR. Leishmaniasis cutánea: Principales diagnósticos diferenciales. *Dermatología Venezolana* 2019; **57**(1). doi: http://saber.ucv.

ve/ojs/index.php/rev_rdv/article/view/27855.

[6] Ministerio de Salud y Protección Social. *Lineamientos de atención clínica integral para Leishmaniasis en Colombia. Versión 4*. Bogotá: Subdirección de Enfermedades Transmisibles, Grupo de Enfermedades Endemoepidémicas; 2023. [Online]. Available from: https://www.minsalud.gov.co/sites/rid/Lists/BibliotecaDigital/RIDE/VS/PP/PAI/Lineamientos-leishmaniasis.pdf. [Accessed on 22 September 2025].

[7] Vélez I, López L, Sánchez X, Mestra L, Rojas C, Rodríguez E. Efficacy of miltefosine for the treatment of American cutaneous leishmaniasis. *Am J Trop Med Hyg* 2010; **83**(2): 351-356.

[8] López L, Robayo M, Vargas M, Vélez ID. Thermotherapy: An alternative for the treatment of American cutaneous leishmaniasis. *Trials* 2012; **13**: 58. doi: 10.1186/1745-6215-13-58. Erratum in: *Trials* 2017; **18**(1): 408. doi: 10.1186/s13063-017-2092-3. PMID: 22594858; PMCID: PMC3441257.

[9] Castro MDM, Rode J, Machado PRL, Llanos-Cuentas A, Hueb M, Cota G. Cutaneous leishmaniasis treatment and therapeutic outcomes in special populations: A collaborative retrospective study. *PLoS Negl Trop Dis* 2023; **17**(1): e0011029. doi: http://dx.doi.org/10.1371/journal.pntd.0011029.

[10]Schad F, Thronicke A. Real-world evidence-current developments and perspectives. *Int J Environ Res Public Health* 2022; **19**(16): 10159. doi: 10.3390/ijerph191610159.

[11]Chacón AC, Romero BV, Vargas MFJ. Leishmaniasis: Evaluación clínica y diagnóstico. *Rev Med Sinerg* 2022; **7**(4): 4. doi: https://doi.org/10.31434/rms.v7i4.781.

[12]Pujol A, Fisa R, Riera C, Rocamora V, Boteller D. Diagnóstico de la leishmaniasis cutánea: Valor de una técnica de reacción en cadena de la polimerasa para la detección de *Leishmania infantum* en muestras recogidas sobre papel de filtro *versus* la histología convencional y la inmunohistoquímica. *Piel* 2012; **27**(9): 527-531. doi: https://doi.org/10.1016/j.piel.2012.06.011.

[13]National Cancer Institute. *Common terminology criteria for adverse events (CTCAE) v5.0. 2017*. [Online]. Available from: https://ctep.cancer.gov/protocoldevelopment/electronic_applications/docs/ctcae_v5_quick_reference_5x7.pdf. [Accessed on 22 September 2025].

[14]Serna Trejos J, Bermúdez Moyano SG. Leishmaniasis cutánea en Colombia: Una mirada epidemiológica. *Rev Eugenio Espejo* 2022; **17**(1): 5-7. doi: https://doi.org/10.37135/ee.04.16.02.

[15]Kaya K, An S. Clinical and sociodemographic characteristics of patients diagnosed with cutaneous leishmaniasis. *Ann Med Res* 2024; **31**(4): 285. doi: https://doi.org/10.5455/annalsmedres.2023.12.338.

[16]Yizengaw E, Gashaw B, Yimer M, Takele Y, Nibret E, Yismaw G. Demographic characteristics and clinical features of patients presenting with different forms of cutaneous leishmaniasis in Lay Gayint, Northern Ethiopia. *PLoS Negl Trop Dis* 2024; **18**(8): e0012409. doi: https://doi.org/10.1371/journal.pntd.0012409.

[17]Hernández AM, Gutierrez JD, Xiao Y, Branscum AJ, Cuadros DF. Spatial epidemiology of cutaneous leishmaniasis in Colombia: Socioeconomic and demographic factors associated with a growing epidemic. *Trans R Soc Trop Med Hyg* 2019; **113**(9): 560-568. doi: https://doi.org/10.1093/trstmh/trz043.

[18]Velez ID, Hendrickx E, Robledo SM, del Pilar Agudelo S. Leishmaniosis cutánea en Colombia y género [Gender and cutaneous leishmaniasis in Colombia]. *Cad Saude Publica* 2001; **17**(1): 171-180. Spanish. doi: 10.1590/s0102-311x2001000100018. PMID: 11241940.

[19]Orkaby AR, Onuma O, Qazi S, Gaziano JM, Driver JA. Preventing cardiovascular disease in older adults: One size does not fit all. *Cleve Clin J Med* 2018; **85**(1): 55-64. doi: 10.3949/ccjm.85a.16119. PMID: 29328899.

[20]Cleven L, Krell-Roesch J, Nigg CR, Woll A. The association between physical activity with incident obesity, coronary heart disease, diabetes and hypertension in adults: A systematic review of longitudinal studies published after 2012. *BMC Public Health* 2020; **20**(1): 726. doi: 10.1186/s12889-020-08715-4. PMID: 32429951; PMCID: PMC7238737.

[21]Lago AS, Lima FR, Carvalho AM, Sampaio C, Lago N, Guimarães LH. Diabetes modifies the clinic presentation of cutaneous leishmaniasis. *Open Forum Infect Dis* 2020; **7**(12). doi: http://dx.doi.org/10.1093/ofid/ofaa491.

[22]Cardona-Arias JA, Vélez ID, Lopez-Carvajal L. Efficacy of thermotherapy to treat cutaneous leishmaniasis: A meta-analysis of controlled clinical trials. *PLoS One* 2015; **10**(5): e0122569. doi: https://doi.org/10.1371/journal.pone.0122569.

[23]Abadías-Granado I, Diago A, Cerro PA, Palma-Ruiz AM, Gilaberte Y. Leishmaniasis cutánea y mucocutánea. *Actas Dermo-Sifiliogr* 2021; **112**(7): 601-618. doi: https://doi.org/10.1016/j.ad.2021.02.008.

[24]López-Carvajal L, Cardona-Arias JA, Zapata-Cardona MI. Efficacy of cryotherapy for the treatment of cutaneous leishmaniasis: Meta-analyses of clinical trials. *BMC Infect Dis* 2016; **16**: 360. Disponible en: https://doi.org/10.1186/s12879-016-1663-3.

[25]Briones Nieva CA, Cid AG, Romero AI, García-Bustos MF, Villegas M, Bermúdez JM. An appraisal of the scientific current situation and new perspectives in the treatment of cutaneous leishmaniasis. *Acta Trop* 2021; **221**(105988): 105988. doi: http://dx.doi.org/10.1016/j.actatropica.2021.105988.

[26]Wolf Nassif P, de Mello TFP, Navasconi TR, Mota CA, Demarchi IG, Aristides SMA. Safety and efficacy of current alternatives in the topical treatment of cutaneous leishmaniasis: A systematic review. *Parasitology* 2017; **144**(8): 995-1004. doi: https://doi.org/10.1017/S0031182017000385.

[27]del Rosal Rabes T, Baquero-Artigao F, García Miguel M. Leishmaniasis cutánea. *Pediatría Atención Primaria* 2010; **12**(46): 263-271. doi: https://www.redalyc.org/articulo.oa?id=366638723008.

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