Research Article

Lifetime and Point Prevalence of Cutaneous Leishmaniasis in the South of Iran

Reyhane Izadi[1], Mohammad Moein Derakhshan Barjoei[2], Samira Pourrezaei[3] and Masoumeh Sadat Mousavi[4, *]

[1]Department of Health Care Management and Information Sciences, Shiraz University of Medical Sciences, Shiraz, Iran
[2]Student Research Committee, Shahid Sadoughi University of Medical Sciences, Yazd, Iran
[3]Department of Virology, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran
[4]Department of Epidemiology and Biostatistics, School of Health, Shahrekord University of Medical Sciences, Shahrekord, Iran

[*]*Corresponding author*: Department of Epidemiology and Biostatistics, School of Health, Shahrekord University of Medical Sciences, Shahrekord, Iran. Email: mousavi68.ma@yahoo.com

Abstract

Background: Cutaneous Leishmaniasis (CL) is a public health problem in many countries in Asia. Fars province in the south of Iran is an area with endemic CL.

Objectives: This study aimed to estimate CL's lifetime and point prevalence in the Fars province's general population.

Methods: This cross-sectional study was conducted on 11779 participants living in Marvdasht, the second largest county of Fars province, Iran, in 2019 to estimate CL's lifetime and point prevalence. In total, 59 urban and 55 rural clusters (with 30 households per cluster) were randomly selected. Door-to-door interviews were conducted by trained nurses to collect the required data.

Results: The point prevalence was estimated at 3.56 (95% confidence interval: 2.6-4.8) per 1000 population. The lifetime prevalence of CL was 8.48 (95% confidence interval:7.99-9.00) per 100 population. There was no difference between urban and rural areas and gender regarding fresh or old scars, and CL scares ($P \leq 0.05$ for all).

Conclusions: Based on the results, Marvdasht in Fars province was the hyperendemic area for CL. Since the lifetime prevalence of CL in Marvdasht is almost 8%, 89% of the people of this city are at risk of contracting *Leishmania*. As a result, more public health interventions are needed to control the CL epidemic in Marvdasht.

Keywords: Prevalence, Lifetime Prevalence, Point Prevalence, Cutaneous Leishmaniasis

1. Background

Leishmaniasis is caused by a parasite from a protozoan family, which occurs in three forms: cutaneous, cutaneous-mucosal, and visceral. The infection is transmitted to humans and other mammals, mainly by being bitten by an infected sandfly (1). The Cutaneous form of leishmaniasis starts with a small bump (papules), which gradually enlarges and turns into scares likely to heal on their own in weeks or months, and sometimes years, imposes a heavy economic burden on society, especially in developing countries (2). Cutaneous leishmaniasis is categorized as either rural (Zoonotic leishmaniasis as wet leishmaniasis or premature leishmaniasis), with rapid growth but mild symptoms caused by *Leishmania major*, or urban (Anthroponotic leishmaniasis as late-onset dry or injured leishmaniasis), with a more prolonged course by *Leishmania tropica* (3, 4). In most cases, patients develop immunity by the natural course of the disease, and the infection is eliminated with a defined scare. Despite no complete elimination of the infection, treatment accelerates the healing process but with a compromised immunity response (5, 6). All patients with urban cutaneous leishmaniasis (ACL), which patients transmit, should be treated to prevent the spread of the disease. However, in rural leishmaniasis (ZCL), covering the wound to prevent flies from access to the contagious wound is very important and sufficient to prevent the infection's spread. The therapeutic goals of CL are: (i) 100% recovery of patients, (ii) prevention of lesion spread mainly in the face, (iii) control of the disease reservoirs, and iv) prevention of complications such as secondary infection, lymphangitis, and prevention of disease recurrence (7). The social stigma caused by

the scares causes many psychological problems in the patients. For example, people with CL scares encounter social limitations in Afghanistan and Colombia ([8], [9]). World Health Organization has announced the family of leishmaniasis infections as one of the six most important tropical and semi-tropical infections worldwide ([10], [11]). Based on the reports, leishmaniasis is endemic in 98 countries ([12]). In addition, it is estimated that about 350 million people are at risk of catching the infection, causing 70,000 deaths ([13]). About 90% of the world's cutaneous leishmaniasis (CL) is reported in Afghanistan, Brazil, Iran, Peru, Saudi Arabia, and Syria ([14]). About 30,000 new cases are reported annually in Iran, which is considered times more significant ([15]). Marvdasht is one of the foci of *Leishmania* in Iran. This is the first study in Iran that simultaneously examines active and old scars in the population to investigate people at risk of contracting the disease in the future and the possibility of epidemics and pandemics.

2. Objectives

This study aims to estimate the lifetime and point prevalence of CL in the general population of the Fars province.

3. Methods

Assuming the presence of CL active and old scars indicates the present and past (lifetime) infections. This study was conducted to investigate the epidemiology of CL in 2019. Accordingly, a cross-sectional study was performed in the county to measure CL's point and lifetime prevalence among the population.

Marvdasht County is 1620 m above sea level with 4649 km^2, located in the North of Fars province, Iran. Based on the 2011 census in Iran, the county has a population of 137,087 whose occupation is mainly agriculture and food industry ([16], [17]).

3.1. Data Collection

Door-to-Door interviews were conducted by a team including a female interviewer. Interviews were performed by explaining the active and old scare pictures and symptoms to the housewife and completing a checklist with two sections regarding demographic and CL history among the householders ([18], [19]).

3.2. Sampling

A two-stage systematic random and cluster sampling was carried out to select 59 urban and 55 rural clusters (based on the rural and urban population) from a list of all urban and rural households covered by Marvdasht health center (covering more than 95% of the population). Each cluster was selected randomly within a list of all rural or urban households registered with the health cancer as a cluster's starting point, which included 30 neighboring households on the right of the cluster starting point. The sampling interval was identified by dividing the number of households (in urban and rural areas) by the defined number of clusters.

3.3. Statistical Analysis

Descriptive statistics (mean and percentage) were used to summarize the data. Chi-square was used to compare quantitative and qualitative variables distribution among the comparing groups. SPSS software Version 16 was used to analyze the data. The difference is considered statistically significant if $P < 0.05$.

4. Results

A total of 3258 households, including 1608 urban and 1650 rural, were visited in this study, and 11,779 individuals were included. The results showed that the point prevalence of CL was 3.56 (2.6 - 4.8) per 1000 population (42 individuals with active scars). In addition, the lifetime prevalence among the study population was 8.48% (7.99 - 9) (998 individuals with old scars) (Table 1).

A total of 0.36% and 8.30% of patients with active or old CL scars were males, respectively. On average, those with active or old scars were 36.05 ± 21.10 and 35.59 ± 19.34 years old, respectively. The highest prevalence of active and old CL scars was among those in 2 - 40 years. The lowest prevalence of active and old scars was among those under-five years of age, and 38.37% of patients with CL scare were housewives and jobless (Table 2).

There was no difference between urban and rural areas and gender in terms of fresh or old scars, and CL scares ($P \geq 0.05$ for all) (Table 3). The most commonly used method for preventing CL was using more than one method (64.91%) (2115 people) to prevent mosquito bites (Table 4).

5. Discussion

The present study investigated CL's point and lifetime prevalence in the general population of Mardusht in 2019. CL prevalence was 3.56 per 1000, and the lifetime prevalence was 8.5 per 100.

Table 1. Point and Lifetime Prevalence of Cutaneous Leishmaniasis in Marvdasht, Fars Province Iran, 2019

Variables	Total	Male	Female
Point prevalence (active scar)	0.35 (0.26 - 0.48)	0.37 (0.23 - 0.55)	0.27 (0.15 - 0.45)
Lifetime prevalence (old scar)	8.48 (7.99 - 9)	8.31 (7.64 - 9.02)	7.61 (6.91 - 8.34)

Table 2. Distribution of CL Scar by Age and Job Participants in Marvdasht, Fars Province, Iran [a]

Variables	Population	With CL Active Scare	With CL Old Scare
Age, y (mean ± SD)	35.79 ± 20.14	36.0 ± 21.1	35.59 ± 19.34
< 5	1178 (9.9)	3 (0.25)	32 (2.71)
Between 6 and 20	2443 (20.47)	7 (0.28)	197 (8.06)
Between 21 and 40	5803 (49.26)	24 (0.41)	661 (11.39)
> 41	2355 (19.99)	7 (0.29)	108 (4.58)
P-value	-	0.69	0.0001
Job			
Housekeeper/jobless	4716 (40.03)	19 (0.40)	383 (8.21)
Private job/clerk	2952 (25.06)	7 (023)	75 (2.5)
Student/soldier	1179 (9.99)	5 (0.46)	176 (14.92)
Farmer/rancher	1435 (12.18)	9 (0.62)	80 (5.57)
< 7 years	1497 (12.7)	2 (0.13)	40 (2.67)
P-value	-	0.15	0.0001

[a] Values are expressed as No. (%) unless otherwise indicated.

Table 3. Distribution of CL Scar by Gender and Residency of the Included Individuals in Marvdasht, Fars Province, Iran, 2019

Variables	Rural, No. (%) [a]	Urban, No. (%) [a]	P-Value	Male, No. (%)	Female, No. (%)	P-Value
Active scar			0.99			0.36
Yes	19 (1.8)	33 (1.39)		15 (0.02)	23 (0.36)	
No	1589 (98.81)	1627 (98.6)		5505 (99.72)	6236 (99.63)	
Old scar			0.79			0.16
Yes	657 (35.26)	431 (26.12)		420 (7.6)	520 (8.3)	
No	1041 (64.73)	1219 (73.87)		5100 (92.39)	5739 (91.69)	

[a] Household base.

According to Asadi et al., the lifetime prevalence of CL was estimated at 15.4 per 100,000 in Fars Province (20), which was lower than the same figure in Marvdasht. In addition, the lifetime prevalence was 20.32 and 25.93 in men and women, respectively. The prevalence of CL (lifetime and the current prevalence) was higher in men than women, which is consistent with the same results obtained for Iran (21-23).

The average age of actives scar was 36.05 for people with leishmaniasis; old scars were 35.59. Most of the frequency of active and old scars was in the age group of 21 to 40 years. In Almasi-Hashiani et al.'s study, the most reported cases were 15-30 years old (24). In Khajedaluee et al., the prevalence of the disease by age group was in the age group ≥ 10 years, and the lowest was in the age group more than 61 years (25).

This study revealed that the lowest frequency of people with leishmaniasis (active and old scar) was related to the age group of fewer than five years. In Khosravani Poor et al., the highest prevalence of the disease was found in the age group below ten years old. In the present study, 3.63% of the people had an active lesion, and the highest frequency of the infection (21.91%) was found in the age group of 0 - 4 years (21).

In this study, only 9.8% of the households use mosquito nets, probably due to low income. This result is consistent

Table 4. Distribution by Insect Bite Protection Tool of Participants in Marvdasht, Fars Province, Iran, 2019

Variables	No. (%)
Used protection instrumentation [a]	
Mosquito net	309 (9.48)
Lace	477 (14.64)
Insect repellent pen	12 (0.36)
Clothes	140 (4.29)
No protection	205 (6.29)
More than one protection tool	2115 (64.91)

[a] Household base.

with that of Khosravani Poor et al.'s study, which showed that a small percentage of households use mosquito nets (21). In general, the use of personal protective equipment in this study was high, while this rate was low in Heshmati et al. in Yazd (26).

5.1. Limitations

This study was cross-sectional, and it was impossible to investigate the relationship between fresh wounds and related factors.

5.2. Conclusions

Marvdasht is one of the important centers with high pollution in Fars province. Based on the results, about 90% of the population of Marvdasht is not safe from this disease with the high frequency of active scares in the area, and they are prone to infection. Therefore, CL is a severe health problem, and an epidemic is probable to occur in the area.

Acknowledgments

Footnotes

References

1. Alemayehu B, Alemayehu M. Leishmaniasis: A Review on Parasite, Vector and Reservoir Host. *Health Sci J.* 2017;**11**(4). https://doi.org/10.21767/1791-809x.1000519.

2. Hayani K, Dandashli A, Weisshaar E. Cutaneous leishmaniasis in Syria: clinical features, current status and the effects of war. *Acta Derm Venereol.* 2015;**95**(1):62–6. [PubMed ID: 25342106]. https://doi.org/10.2340/00015555-1988.

3. Reyburn H, Rowland M, Mohsen M, Khan B, Davies C. The prolonged epidemic of anthroponotic cutaneous leishmaniasis in Kabul, Afghanistan: 'bringing down the neighbourhood'. *Trans R Soc Trop Med Hyg.* 2003;**97**(2):170–6. [PubMed ID: 14584372]. https://doi.org/10.1016/s0035-9203(03)90111-8.

4. Yucel A, Gunasti S, Denli Y, Uzun S. Cutaneous leishmaniasis: new dermoscopic findings. *Int J Dermatol.* 2013;**52**(7):831–7. [PubMed ID: 23789601]. https://doi.org/10.1111/j.1365-4632.2012.05815.x.

5. Naafs B, van Hees CL, van Ingen J. Mycobacterial (Skin) Infections. *Antibiotic and Antifungal Therapies in Dermatology.* Springer; 2016. p. 81–139.

6. Masmoudi A, Hariz W, Marrekchi S, Amouri M, Turki H. Old World cutaneous leishmaniasis: diagnosis and treatment. *J Dermatol Case Rep.* 2013;**7**(2):31–41. [PubMed ID: 23858338]. [PubMed Central ID: PMC3710675]. https://doi.org/10.3315/jdcr.2013.1135.

7. Shirzadi MH. *[Guidelines for the care of cutaneous leishmaniasis (SALK) in Iran].* Tehran, Iran: Ministry of Health and Medical Education; 2012. Persian. Available from: https://health.mubabol.ac.ir/download/?id=3704.

8. Kassi M, Kassi M, Afghan AK, Rehman R, Kasi PM. Marring leishmaniasis: the stigmatization and the impact of cutaneous leishmaniasis in Pakistan and Afghanistan. *PLoS Negl Trop Dis.* 2008;**2**(10). e259. [PubMed ID: 18958168]. [PubMed Central ID: PMC2569210]. https://doi.org/10.1371/journal.pntd.0000259.

9. van Wijk R, van Selm L, Barbosa MC, van Brakel WH, Waltz M, Philipp Puchner K. Psychosocial burden of neglected tropical diseases in eastern Colombia: an explorative qualitative study in persons affected by leprosy, cutaneous leishmaniasis and Chagas disease. *Glob Ment Health (Camb).* 2021;**8**. e21. [PubMed ID: 34249368]. [PubMed Central ID: PMC8246647]. https://doi.org/10.1017/gmh.2021.18.

10. den Boer M, Argaw D, Jannin J, Alvar J. Leishmaniasis impact and treatment access. *Clin Microbiol Infect.* 2011;**17**(10):1471–7. [PubMed ID: 21933305]. https://doi.org/10.1111/j.1469-0691.2011.03635.x.

11. von Stebut E, Sunderkotter C. [Cutaneous leishmaniasis]. *Hautarzt.* 2007;**58**(5):445–58. quiz 459. [PubMed ID: 17447043]. https://doi.org/10.1007/s00105-007-1327-8.

12. Torgerson PR, Macpherson CN. The socioeconomic burden of parasitic zoonoses: global trends. *Vet Parasitol.* 2011;**182**(1):79–95. [PubMed ID: 21862222]. https://doi.org/10.1016/j.vetpar.2011.07.017.

13. Torres-Guerrero E, Quintanilla-Cedillo MR, Ruiz-Esmenjaud J, Arenas R. Leishmaniasis: a review. *F1000Res.* 2017;**6**:750. [PubMed ID: 28649370]. [PubMed Central ID: PMC5464238]. https://doi.org/10.12688/f1000research.11120.1.

14. Patino LH, Mendez C, Rodriguez O, Romero Y, Velandia D, Alvarado M, et al. Spatial distribution, Leishmania species and clinical traits of Cutaneous Leishmaniasis cases in the Colombian army. *PLoS Negl Trop Dis.* 2017;**11**(8). e0005876. [PubMed ID: 28850603]. [PubMed Central ID: PMC5593196]. https://doi.org/10.1371/journal.pntd.0005876.

15. Mesgarian F, Rahbarian N, Mahmoudi Rad M, Hajaran H, Shahbaz F, Mesgarian Z, et al. Identification of Leishmania species isolated from human cutaneous Leishmaniasis in Gonbad-e-Qabus city using a PCR method during 2006-2007. *Tehran Univ Med J.* 2010;**68**(4).

16. Fararouei M, Derakhshan Barjoei MM, Izadi R, Afsar-kazerooni P, Mousavi MS. Point and Lifetime Prevalence of Sexually Transmitted Diseases Based on the Definitions of the Iranian Syndrome Surveillance System: A Hospital-Based Survey. *Arch Clin Infect Dis*. 2023;**18**(1). https://doi.org/10.5812/archcid-132178.

17. Mousavi MS, Fararouei M, Afsar-Kazerooni P, Nasirian M, Ghaem H. Evaluation of Conducting Phone Interviews on Sexual Behavior: An Iranian Population-Based Study. *Shiraz E-Med J*. 2022;**23**(6). https://doi.org/10.5812/semj-118708.

18. Mousavi MS, Fararouei M, Afsar Kazerooni P, Nasirian M, Ghaem H. Care-seeking Pattern in the General Iranian Population with Sexually Transmitted Infection Syndromes: A Population-Based Survey. *J Occup Health Epidemiol*. 2022;**11**(4):275–80. https://doi.org/10.52547/johe.11.4.275.

19. Mousavi M, Fararouei M, Kazerooni PA, Nasirian M, Ghaem H. Population based estimation of point and period prevalence of sexully transmitted infections based the iranian symptoms surveillance system. *Amazonia Investiga*. 2019;**8**(18):29–42.

20. Asadi A, Moradinazar M, Marzbani B, Mohammadi A, Mehdizad R, Shakiba E, et al. [Epidemiological Study of Cutaneous Leishmaniasis in Kermanshah Province, 2011-2019]. *J Mazandaran Univ Med Sci*. 2022;**32**(212):155–62. Persian.

21. Khosravani Poor H, Ali Akbar Poor M, Zare Askari A, Danesh M, Keshavarz A, Palizian B. Lifetime prevalence of cutaneous leishmaniasis scar in the city of Kherameh, Fars province, Iran (2015). *J Occup Health Epidemiol*. 2019;**8**(1):12–20. https://doi.org/10.29252/johe.8.1.12.

22. Sabzevari S, Teshnizi SH, Shokri A, Bahrami F, Kouhestani F. Cutaneous leishmaniasis in Iran: A systematic review and meta-analysis. *Microb Pathog*. 2021;**152**:104721. [PubMed ID: 33539962]. https://doi.org/10.1016/j.micpath.2020.104721.

23. Foroutan M, Khademvatan S, Majidiani H, Khalkhali H, Hedayati-Rad F, Khashaveh S, et al. Prevalence of Leishmania species in rodents: A systematic review and meta-analysis in Iran. *Acta Trop*. 2017;**172**:164–72. [PubMed ID: 28454881]. https://doi.org/10.1016/j.actatropica.2017.04.022.

24. Almasi-Hashiani A, Shirdare MR, Emadi J, Esfandiari M, Pourmohammadi B, Hossieni SH. Epidemiological Study of Cutaneous Leishmaniasis in Marvdasht, Fars province, Iran. *J N Khorasan Univ Med Sci*. 2012;**3**(4):15–23. https://doi.org/10.29252/jnkums.3.4.15.

25. Khajedaluee M, Yazdanpanah MJ, SeyedNozadi S, Fata A, Juya MR, Masoudi MH, et al. Epidemiology of cutaneous leishmaniasis in population covered by Mashhad University of Medical Sciences in 2011. *Med J Mashhad Univ Med Sci*. 2014;**57**(4):647–54. https://doi.org/10.22038/mjms.2014.3213.

26. Heshmati H, Charkazi A, Hazavehei S, Rahaei Z, Dehnadi A. [Factors related to cutaneous leishmaniasis preventive behaviors on the basis of BASNEF Model in residents of endemic areas in Yazd, Iran]. *Health Sys Res*. 2012;**7**(6):926–34. Persian.