

RESEARCH ARTICLE

Burden and Trends of Leishmaniasis over the Last One Decade across the Globe: Trend Analysis of WHO Regions

Hend M. Al-Atif, MD 

Department of Internal Medicine, College of Medicine, King Khalid University, Kingdom of Saudi Arabia.

ABSTRACT

Introduction: In terms of the global burden of diseases, leishmaniasis is the third most serious and often fatally untreated tropical disease. The number of people suffering from leishmaniasis is estimated to be 12–15 million. Because of the comparatively underestimated reported number of cases, leishmaniasis is not seen as an immediate health issue in various regions by local and international health policymakers. Therefore, strong evidence is required for policymakers to make decisions. Therefore, we aimed to conduct secondary data analysis to assess the trends of Leishmaniasis over the last decade and understand the endemicity of different regions for Leishmaniasis across the world. **Methods:** We undertook a retrospective study with secondary data analysis of the WHO data from 2008 to 2018, publicly available, for cutaneous and visceral Leishmaniasis. The data for around 194 countries were included in the analysis and these countries were merged into different regions based on the WHO classification. We categorized all 94 countries into regions such as America, Europe, Africa, South-East Asia, the Eastern Mediterranean, and Western Pacific. Since the data were limited to the frequency of cases and there were no other variables, therefore, we were able to do the descriptive analysis. **Results:** Generally, the number of cutaneous Leishmaniasis cases has declined for all regions except for the Eastern Mediterranean region. A declining trend of imported cases of cutaneous Leishmaniasis was found for all regions mainly from 2015 to 2018. The cases of visceral leishmaniasis in the Eastern Mediterranean region, Africa, America, and Europe have remained stable. However, after remaining stagnant for about four years, the number of visceral leishmaniasis in South Asia showed a steep decline. Of the 194 countries, 76.39% are considered as endemic for cutaneous Leishmaniasis and 44.3% are considered as endemic for visceral Leishmaniasis. **Conclusion:** Though cases of Leishmaniasis have decreased over the past decade, regions need to make efforts to capture the true number of cases with an effective surveillance system. There appears to be a stable trend in most countries, although it is unclear whether that trend is due to regulation steps taken by various governments or to cases being underreported. Governments in various regions therefore need to make efforts to identify true cases and to take effective control steps.

KEYWORDS: Leishmaniasis, Trends, Globe, Endemicity

Correspondence: Dr Hend M. Al-Atif, Department of Internal Medicine, College of Medicine, King Khalid University, Kingdom of Saudi Arabia. Email: hotaif@kku.edu.sa

Copyright © 2020 Al-Atif H M. This is an open access article distributed under the [Creative Commons Attribution 4.0 International](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Leishmaniasis is a severe and frequently deadly neglected tropical disease related to undernourishment, population movement, inadequate housing, and a feeble immune system, which chiefly affects the poor (1, 2). Leishmaniasis is the third most severe arthropod-borne disease in terms of the global burden of diseases (3). Due to its close association with poverty and the inadequate resources supplied in new instruments for diagnosis, treatment, and control, leishmaniasis is believed one of the "most neglected diseases" (4). Leishmaniasis is categorized into cutaneous, mucocutaneous, diffuse skin, and visceral types on the basis of clinical symptoms (5, 6).

Leishmaniasis has three clinical forms: visceral (also known as kala-azar), cutaneous, and mucocutaneous(5, 6). The most serious form of leishmaniasis is visceral and almost always fatal if untreated (5, 6). The principal vectors of leishmaniasis are phlebotomine sand flies and there is a positive association between the geographic distribution of sand flies and the disease (7).

Various types of leishmaniasis have been found in 89 countries, according to the World Health Organization, and over 350 million people are at risk. It is estimated that the number of individuals suffering from leishmaniasis is twelve to fifteen million. There are two million new cases

of leishmaniasis per year, of which around half million are visceral leishmaniasis infected cases and one and half million are cutaneous Leishmaniasis infected cases (8). In 2015, more than 60% of the new cases of cutaneous leishmaniasis (CL) arose in six countries, including Afghanistan, Colombia, Brazil, and Iran, according to WHO records (9). In tropical and subtropical regions, they are more common (10). Cutaneous and visceral manifestations of the disease occur predominantly in fourteen Eastern Mediterranean countries (11). In several geographic regions, leishmaniasis has emerged or re-emerged, which provokes global health and economic problems influencing humans, animals, and the natural world. (12). It is endemic in 98 countries with > 350 million susceptible people with around 700 000-1.2 million new cases, 600 000-1 million new cases of cutaneous disease additional every year, 50 000-90 000 new cases of visceral leishmaniasis additional per annum, and about 20 000-40 000 losses annually from the disease (9, 13, 14). In six countries, namely Sudan, India, Ethiopia, Nepal, Bangladesh, South Sudan, and Brazil, more than 90% of the yearly incidences of visceral Leishmaniasis occur (9, 14-17). Eastern Africa is the second biggest visceral Leishmaniasis focus, adding to the global burden with 30,000-40,000 new cases each year after the Indian sub-continent (9, 13). In 2015, close to 200,000 visceral Leishmaniasis cases were registered to the WHO (18); these figures are believed to reflect a major underestimate, especially in Africa. Leishmaniasis ranks second in mortality and seventh in loss of disability-adjusted life years among tropical diseases (3, 19). Leishmaniasis is not seen by local and international health policymakers as an urgent health problem in different regions, likely due to the presumed non-serious nature of CL and the relatively underestimated number of cases registered (20, 21). This reveals that strong evidence is required about the number of cases of Leishmaniasis for policymakers to make decisions. Such evidence can come from reliable sources such as WHO, however, the data from such sources need to be adequately analyzed to make evidence-based decisions. Therefore, we aimed to conduct secondary data analysis to understand the endemicity of different regions for Leishmaniasis across the world. Besides, we also purported to assess the trends of Leishmaniasis cases over the last decade.

MATERIALS AND METHODS

We undertook a retrospective study with secondary data analysis of the publicly available data for cutaneous and visceral Leishmaniasis. Primarily recent data of WHO was used that was available from 2008 to 2018 for visceral and cutaneous leishmaniasis. The data sheets of WHO had cases that were categorized into crude cases of cutaneous and visceral Leishmaniasis that were prevalent in different countries. Further, data were also available for imported cases of visceral and cutaneous leishmaniasis. Apart from this, we also approached the data sheets to assess the endemicity of various countries for visceral and cutaneous leishmaniasis. The data for around 94 countries were included in the analysis and these countries were merged into different regions based on the WHO classification. We categorized all 94 countries into regions such as America, Europe, Africa, South-East Asia, the Eastern Mediterranean, and Western Pacific. Since data for only

one country were available in the Western Pacific region, therefore, we merged this with South-East Asia. After cleaning the data, we matched each country with its respective region and calculated the total number of cases after merging the data from different files. All countries with missing data were not included in the analysis and thus were not assigned respective regions. We imported the files into statistical software and analyzed the data by running frequencies. Since the data were limited to the frequency of cases and there were no other variables, therefore, we were able to do the descriptive analysis. We assessed the trends of cases of visceral and cutaneous leishmaniasis over the last ten years. However, the data were available for imported cases for the last six years. For the study of the data obtained, SPSS software was used, and findings were drawn up in the form of graphs. Since the data were publicly available, no ethical approval was required.

RESULTS

Figure 1 illustrates the trends for the number of cases for cutaneous Leishmaniasis over the last ten years from 2008 to 2018. Overall, the frequency of cases is high in different countries of the Eastern Mediterranean region when compared to the other regions. The data shows that there are fluctuations in the number of cases in the Eastern Mediterranean region with a small dip in 2014 followed by another dip in 2017. Overall cases range from 99241 in 2008 to 181497 in 2018 with an upsurge in the cases in the last few years. In contrast, the number of cutaneous Leishmaniasis cases has declined in the region in America. It seems the cases are stagnant between 45738 in 2008 and 60509 in 2018 without a sharp decline. However, overall, the region of America stands second in the frequency of cases after the Eastern Mediterranean region. The third region with the highest number of cases in Africa, where cases range between 6546 and 15709 over the last 10 years without any significant decline or upsurge in the cases. The regions with comparatively a smaller number of cases are Europe and South-east Asia where cases have remained constant over the last 10 years. However, in Europe, the highest number of cases was found in 2018.

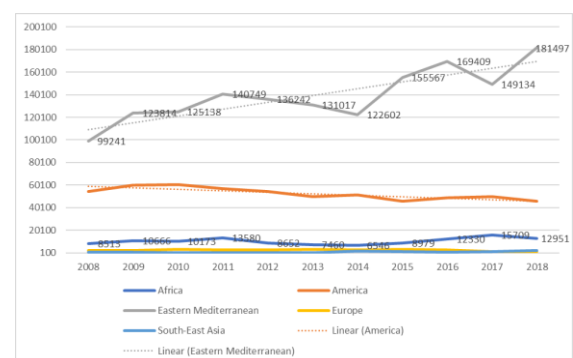


Figure 1: Trend for number of cutaneous Leishmaniasis cases over the last ten years in different regions.

Figure 2 demonstrates the trends of imported cases of cutaneous Leishmaniasis over the last six years from 2013 to 2018. Generally, the number of imported cases has declined in all regions from 2013 to 2018 with all regions having an approximately similar number of cases in 2018. However, the Eastern Mediterranean region shows greater fluctuations in the imported cases with a sharp upsurge in

2017 followed by a steep decline in 2018. Likewise, the region of Europe had a higher number of imported cases in 2013 with a significant decline in the cases in 2015 followed by a constant trend from 2016 to 2018. A minimum number of imported cases have been reported in the African region with zero frequency in 2014, 2016, and 2018. Likewise, there were zero imported cases reported in South-East Asia in 2013 and 2014 with very few cases in the remaining years. However, the data shows a relative but unremarkable increase in the number of cases in America with a minimum of 15 cases reported in 2013 to more than 300 imported cases in 2018.

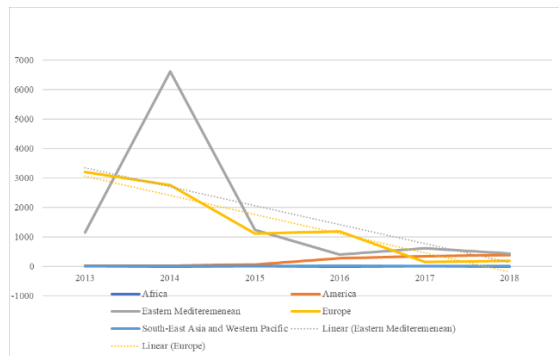


Figure 2: Trends for number of imported cases of cutaneous Leishmaniasis from 2013 to 2018.

Figure 3 shows the trend of the frequency of visceral Leishmaniasis from 2008 to 2018. The data shows that South-East Asia is the region with more fluctuations in the number of visceral cases. Overall, the number of visceral cases in South-East Asia was found to be higher from 2008 to 2013, however, a sharp decline has been noticed in the cases from 2013 to 2018 with almost comparable cases to other regions in 2018. The minimum number of cases was found in 2018 (4748) and the maximum was in 2018 (35502) as shown in figure 3. In contrast, the number of visceral Leishmaniases cases are pretty much constant across other regions with a slight bulge in the cases from 2009 to 2012 in the Eastern Mediterranean region. Generally, Europe is the region with a fewer number of cases over the last decade ranging from 183 in 2017 to 667 in 2008.

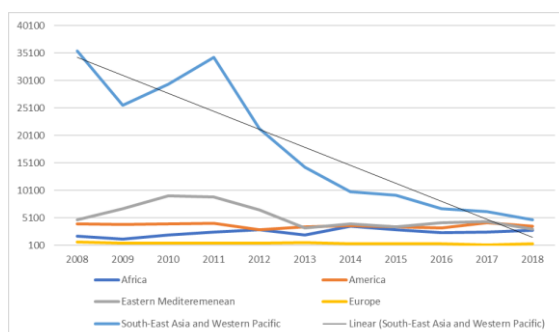


Figure 3: Trend of cases of visceral Leishmaniasis from 2008 to 2018

Figure 4 shows trends of imported cases of visceral Leishmaniasis. Generally, the cases have declined over the last six years and there is a convergence of cases in 2018 across all regions. While comparing different regions, Eastern Mediterranean and Europe show two peaks in 2014 and 2016, respectively. However, there is a sharp decline in cases in the Eastern Mediterranean region from

2014 (n=55) to 2015 (n=9). In contrast, Europe shows fluctuations in the number of visceral Leishmaniasis cases with minimum cases in 2018 (n=9) and maximum in 2016 (n=36). There is also a steep decline in the number of imported visceral Leishmaniasis cases in South-East Asia over the last five years. In 2018, South-East Asia had a minimum number of cases when compared to the previous years. However, there is a slightly inverse pattern is observed in America, where the number of imported cases has slightly raised higher in 2017 (n=9) and 2018 (n=8) when compared to the other years and regions. Lastly, Africa is the region with the lowest number of imported cases of visceral leishmaniasis with a relatively stagnant pattern of cases over the last six years.

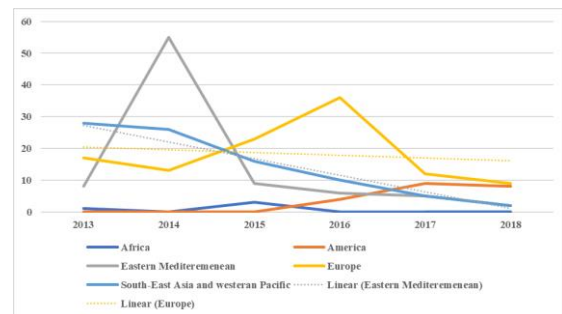


Figure 4: Number of imported cases of visceral Leishmaniasis from 2013 to 2018

Figure 5 and 6 demonstrates the status of endemicity for cutaneous and visceral Leishmaniasis. Around three-fourths of the 194 countries (76.39%) are considered as endemic for cutaneous Leishmaniasis (figure 5) when compared to 44.3% of the endemicity for visceral Leishmaniasis (Figure 6).

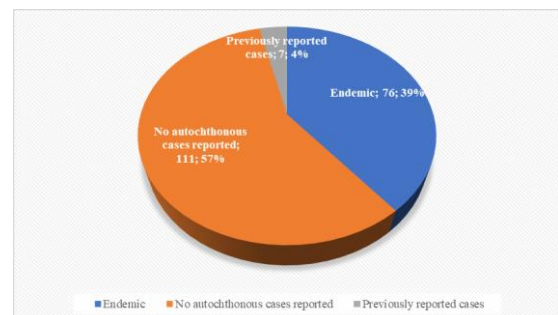


Figure 5: Status of endemicity of visceral leishmaniasis (n=194).

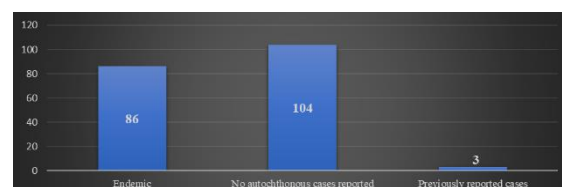


Figure 6: Status of endemicity of cutaneous leishmaniasis (n=194).

DISCUSSION

To understand the endemicity of various regions of Leishmaniasis worldwide and to measure trends in cases of Leishmaniasis over the last decade, we aimed to perform secondary data analysis. Overall, our findings revealed that the number of cutaneous Leishmaniasis cases has declined for all regions except for the Eastern Mediterranean region. These findings might be due to the true augmentation of cases in the Eastern Mediterranean

region over many years or this might be due to an improved reporting system. This is because multiple countries have established surveillance systems in the region to improve the reporting mechanism of Leishmaniasis. Likewise, we found a declining trend of imported cases of cutaneous Leishmaniasis for all regions mainly from 2015 to 2018. However, there were relatively higher cases in the Eastern Mediterranean region. These findings can be collectively explained by numerous reasons such as underreporting of the cases or true decline in the number of cases due to effective interventions taken by the respective government of the regions. In contrast to these findings, the cases for visceral Leishmaniasis have remained stable for the Eastern Mediterranean region, Africa, America, and Europe. However, the number of visceral Leishmaniasis has shown a steep decline in South Asia after being remained stagnant for around four years. The existing literature reveals that generally, Leishmaniasis is on the wane in South-East Asian countries, however, there are few countries in the region with a higher number of cases. Further, findings revealed that imported cases were higher in the Eastern Mediterranean regions in initial years followed by a rapid decline in 2015 and stable frequency then onwards. Since we did not explore the reasons for such a pattern in our study due to limited data, these patterns could be seasonal or migratory or even the lifestyle of the people living in a particular country. For example, the existing evidence demonstrates that people living in the highlands are heavily exposed to sandflies due to sleeping outside the house in the farm and camp. The explanation may be because visceral leishmaniasis epidemics are often related to migration and the introduction of non-immune individuals into areas with current transmission cycles, and most migrants live outside the home. However, future research is required to understand the underlying reasons that could explain such patterns. In addition, a unique pattern of leishmaniasis cases in the Eastern Mediterranean region can be explained by several factors(11). Most of them rely on human activities, such as changes in the climate, relocation of non-immune communities, or the construction of agro-industrial projects, military activities, urbanization, etc. Further, environmental modifications, such as dam building, may alter soil and vegetation temperature and humidity, which may result in changes in the composition and density of sandfly species, as well as changes in the rodent species populations(22). The advent of new colonies with non-immune populations promotes the production of leishmaniasis. The rise of leishmaniasis in the regions might also result from the disruption of control methods previously used, such as insecticide spraying or early detection and treatment of positive cases. Surprisingly, the data shows a stable number of cases in the African region, which might be due to the underreporting of cases. There is no proper surveillance system in the region that could trace and detect cases on time (23). Further, the rural to urban migration and infrastructure in most African

countries do not coincide with the number of cases(24). The existing literature on African countries demonstrates the need to develop strong surveillance and monitoring system to detect and report the true number of cases. In contrast, there is a rapid decline in the number of visceral leishmaniasis cases in the South-East Asia region that reflects the underlying efforts of the governments in the region(25). For example, in the past, attempts such as mobilization of resources, surveillance systems to diagnose and report cases, and active case detection have been enforced to reduce the number of cases over time(25). However, the sustainability of such achievement will depend on the availability of funds, political will, concentrated analysis, and strict oversight over the years.

STRENGTHS AND LIMITATIONS

One of the biggest strengths of this analysis was that it was a regional level analysis that provides an overview of the number of cases of Leishmaniasis across the world. Second, we were able to see the trends for the last ten years that could provide useful insights to researchers and policymakers for evidence-based decisions. However, findings need to be interpreted with caution due to the inherent limitations of the study. For example, the data were not available for all countries in the regions. Second, data were not available for sociodemographic and geographic factors of the region to identify the factors and explore reasons for different trends of the cases in the regions.

CONCLUSION

Although the cases of Leishmaniasis have declined over the last decade, regions need to put efforts to capture the true number of cases with a proper surveillance system. It seems that there is a stable trend in most regions, but it is ambiguous whether such a trend is due to control measures taken by different governments or due to underreporting of the cases. Therefore, governments of different regions need to make efforts to correctly identify the cases and take appropriate control measures. Long-term and short-term strategic plans need to be developed by the regions to address this neglected disease across the world.

ACKNOWLEDGMENTS

None.

AUTHOR'S CONTRIBUTIONS

The participation of the author corresponds to the criteria of authorship and contributorship emphasized in the [Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly work in Medical Journals of the International Committee of Medical Journal Editors](#).

COMPETING INTERESTS

The author declares no competing interests with this case.

FUNDING SOURCES

None.

REFERENCES

- [1] Assimina Z, Charilaos K, Fotoula B. Leishmaniasis: An overlooked public health concern. *Health Science Journal*. 2008;2(4).
- [2] Security Cff, Health P. Leishmaniasis (cutaneous and visceral). 2009.
- [3] Global, regional, and national disability-adjusted life-years (DALYs) for 315 diseases and injuries and healthy life expectancy (HALE), 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet (London, England)*. 2016;388(10053):1603-58.
- [4] Yamey G, Torreele E. The world's most neglected diseases. *BMJ (Clinical research ed)*. 2002;325(7357):176-7.
- [5] Leta S, Dao TH, Mesele F, Alemayehu G. Visceral leishmaniasis in Ethiopia: an evolving disease. *PLoS neglected tropical diseases*. 2014;8(9):e3131.
- [6] Spear RC. Review of "Mathematical Models for Neglected Tropical Diseases: Essential Tools for Control and Elimination, Part B" Edited by Maria-Gloria Basáñez and Roy M. Anderson. *Parasites & vectors*. 2017;10(1):38.
- [7] Norouzi B, Hanafi-Bojd A-A, Moin-Vaziri V, Noorollahi A, Azari-Hamidian S. Ecology of sand flies (Diptera: Psychodidae, Phlebotominae) in a new focus of leishmaniasis in northern Iran. *Acta Tropica*. 2020;212:105649.
- [8] Torres-Guerrero E, Quintanilla-Cedillo MR, Ruiz-Esmenjaud J, Arenas R. Leishmaniasis: a review. *F1000Research*. 2017;6:750.
- [9] World Health Organization. (2018). Fact Sheet: Leishmaniasis. Available online at: <http://www.who.int/news-room/fact-sheets/detail/leishmaniasis>.
- [10] Hotez PJ, Savioli L, Fenwick A. Neglected tropical diseases of the Middle East and North Africa: review of their prevalence, distribution, and opportunities for control. *PLoS neglected tropical diseases*. 2012;6(2):e1475.
- [11] Postigo JA. Leishmaniasis in the World Health Organization Eastern Mediterranean Region. *International journal of antimicrobial agents*. 2010;36 Suppl 1:S62-5.
- [12] Oryan A, Akbari M. Worldwide risk factors in leishmaniasis. *Asian Pacific journal of tropical medicine*. 2016;9(10):925-32.
- [13] Oryan A, Alidadi S, Akbari M. Risk factors associated with leishmaniasis. *Tropical Medicine Surgery*. 2014.
- [14] Ready PD. Leishmaniasis emergence and climate change. *Revue scientifique et technique (International Office of Epizootics)*. 2008;27(2):399-412.
- [15] Desjeux P. Leishmaniasis: current situation and new perspectives. *Comparative immunology, microbiology and infectious diseases*. 2004;27(5):305-18.
- [16] Murray HW, Berman JD, Davies CR, Saravia NG. Advances in leishmaniasis. *Lancet (London, England)*. 2005;366(9496):1561-77.
- [17] Dantas-Torres F, Brandão-Filho SP. Visceral leishmaniasis in Brazil: revisiting paradigms of epidemiology and control. *Revista do Instituto de Medicina Tropical de Sao Paulo*. 2006;48(3):151-6.
- [18] Global leishmaniasis update, 2006–2015: a turning point in leishmaniasis surveillance. *Releve epidemiologique hebdomadaire*. 2017;92(38):557-65.
- [19] Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980-2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet (London, England)*. 2016;388(10053):1459-544.
- [20] Burza S, Croft SL, Boelaert M. Leishmaniasis. *Lancet (London, England)*. 2018;392(10151):951-70.
- [21] World Health Organization. Leishmaniasis. 2019 [cited 2019 Feb 20]. <https://www.who.int/en/news-room/fact-sheets/detail/leishmaniasis> External Link.
- [22] Oryan A, Akbari M. Worldwide risk factors in leishmaniasis. *Asian Pacific journal of tropical medicine*. 2016;9(10):925-32.
- [23] Burki T. East African countries struggle with visceral leishmaniasis. *Lancet (London, England)*. 2009;374(9687):371-2.
- [24] Hotez PJ, Hygiene. The rise of leishmaniasis in the twenty-first century. *Transactions of The Royal Society of Tropical Medicine*. 2018;112(9):421-2.
- [25] Bhattacharya SK, Dash AP. Elimination of Kala-Azar from the Southeast Asia Region. *The American journal of tropical medicine and hygiene*. 2017;96(4):802-4.