RESEARCH NOTE

Bibliometric analysis of Oropouche research: impact on the surveillance of emerging arboviruses in Latin America

[version 1; peer review: 2 approved]

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Abstract

Given the emergence and reemergence of viral diseases, particularly in Latin America, we would like to provide an analysis of the patterns of research and publication on Oropouche virus (OROV). We also discuss the implications of recent epidemics in certain areas of South America, and how more clinical and epidemiological information regarding OROV is urgently needed.

Keywords

Oropouche, arbovirus, epidemiology, public health, travelers, Latin America

This article is included in the **Emerging Diseases and Outbreaks** gateway.

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Any reports and responses or comments on the article can be found at the end of the article.

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Introduction

The Oropouche virus (OROV) is an emerging arbovirus that threatens the Amazon region of Brazil, Peru, and Venezuela¹. The coexistence of this pathogen with other long-term circulating arboviruses, such as dengue virus (DENV), West Nile virus (WNV), Venezuelan Equine Encephalitis (VEEV) and yellow fever virus (YFV), as well as emerging arboviruses such as chikungunya (CHIKV), Zika (ZIKV) and Mayaro virus (MAYV), may hinder clinical diagnosis and successful vector-control strategies². Research is essential to be able to manage this complex scenario. As has been highlighted by Ballabeni and Boggio³, bibliometric analyses of publications on emerging and reemerging viral diseases are important as they may lead to insights on how the global scientific and health communities react to outbreaks. We aimed to conduct a bibliometric analysis of OROV research and the impact on the surveillance of emerging and re-emerging arboviruses in Latin America.

Methods

A bibliometric study was done about OROV scientific production, with a focus on Latin America. We searched in three important regional and international databases (all of them in English): **Science Citation Index Expanded (SCI-E)**, **Scopus** and **Medline (via GoPubMed®)**.

This search strategy used the following key words (MeSH, Medical Subject Headings): “Oropouche” AND “Latin America”, “Oropouche” AND “Argentina”, “Oropouche” AND “Colombia”, and the same way with the rest of the Latin American countries. Also, “OROV” was used instead of Oropouche for additional searches. All study types were included (original articles, reviews, case reports, editorials) and were categorized by year, international cooperation, city and institution, journal and authors with major contribution. Searches were done from May 30 to June 30, 2015.

Data was tabulated and analyzed in Excel 2007® for Windows 7® (**Dataset 1**⁴), summarizing quantitative variables with means and interquartile ranges (IQRs), and qualitative variables with proportions.

Dataset 1. Raw data obtained from bibliographical databases (Medline, Scopus and SCI-E)

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Results

A total of 260 related records were retrieved in our search; from these, 97 manuscripts were recovered in Scopus (55% from Brazil, 28% from US, and 11% from Peru); 83 articles were recovered from Medline (43% from Brazil, 18% from US, and 6% from Peru) and 80 articles were recovered from SCI-E (61% from Brazil, 35% from US, and 15% from Peru) (**Table 1**). As observed in Medline, publications on OROV never reached more than 3 articles per year (**Figure 1**). Analyzing this database, it can be observed that Brazil has the more productive and cooperative research groups in Latin America (**Figure 1**).

Table 1. Countries with highest scientific output on Oropouche, using data taken from Science Citation Index-Expanded, Scopus and/or Medline (up to June 30, 2015).

Rank	Country	Number of articles	Database with highest number of articles
1	Brazil	53	SCOPUS
2	United States	28	SCI-E
3	Peru	12	SCI-E
4	Trinidad and Tobago	8	SCOPUS
4	United Kingdom	8	SCI-E
5	Canada	7	SCOPUS
6	Germany	5	SCI-E
7	Argentina	3	SCI-E
7	Paraguay	3	SCI-E
8	Argentina	2	SCOPUS
8	Netherlands	2	SCI-E
8	Ecuador	2	SCI-E
9	Australia	1	SCOPUS
9	Bolivia	1	SCOPUS
9	Australia	1	SCI-E
9	Argentina	1	Medline
9	Czech Republic	1	Medline
9	Norway	1	Medline
9	Trinidad and Tobago	1	Medline

For Scopus, the annual average number of articles published up to 2014 was 5 (IQR: 1–17) (**Figure 2**). In June 2015, only two articles had been published that year. Nevertheless, after 1996, although not uniform, there was an increasing trend in the number of articles published on OROV per year, reaching 9 in 2011 (**Figure 2**). At Scopus 19 countries contributed to the publication of at least 1 paper during the study period (**Figure 3**). For SCI-E, the annual average number of articles published up to 2014 was 6.2 (IQR: 1–20), with 16 countries contributing to the publication of at least 1 paper during the study period (**Figure 4**).

“Universidade de Sao Paulo” in Sao Paulo, Brazil, was the institution with the most prolific research contribution, and “Figueiredo, L.T.M” was the author with the longest record in Oropouche research, with 12 articles (**Figure 1** and **Figure 2**). The greatest H-indexes for Oropouche issues came from Brazil (H-index=12, 431 citations), the United States of America (H-index=10, 339 citations), Peru (H-index=9, 234 citations), United Kingdom (H-index=6, 144 citations), Canada (H-index=5, 155 citations) and Trinidad and Tobago (H-index=4, 92 citations).

Figure 1. Graphical representation of major international research networks involved in research on Oropouche (via GoPubMed®) and research trends from 1970 to 2015.

Figure 2. Research trends on Oropouche virus from 1960 to 2016. Data taken from Scopus.

Figure 3. Research on Oropouche virus, ranked by contributing countries (%). Data taken from Scopus.

Figure 4. Research on Oropouche virus, ranked by contributing countries (%). Data taken from SCI-E.

Discussion

OROV outbreaks increase when the rainy season starts (January to June) in endemic areas, where the population density of *Culicoides paraensis* is high¹. In fact, the OROV dispersion routes and its genetic diversity⁵ impacted on the growth of scientific publications, as well as on the international collaboration on this topic. On the 2nd of May 2016, the Ministry of Health of Peru reported 57 cases of OROV fever⁶. Most cases originate in towns located in the northern part of the Cusco Region, which is situated in the Amazon rainforest. 79% were detected in January, with only 7% and 14% of the cases being identified in February and March, respectively. There were no fatalities and all patients have recovered following symptomatic treatment. In February 2016, a field mission to the Madre de Dios Region conducted jointly by the Ministry of Health of Peru and PAHO/WHO revealed a mixed outbreak of dengue (DENV-2) and OROV. While Madre de Dios already experienced an outbreak of OROV fever in 1994, at the time of the mission in February, this latest outbreak was of a higher magnitude, with 120 confirmed cases⁶. Cases have also been reported in other nearby countries such as Panama, Trinidad and Tobago and Brazil, and very recently in Venezuela (2016)^{1,7}. It highlights the potential for expansion of OROV and other related reassortant viruses to other countries in the region, such as Colombia, Venezuela and Ecuador, amongst others in South and Central America.

Despite this epidemiological situation, research on OROV is far below the level of research on other emerging arboviruses in Latin America such as CHIKV (6,344 articles recovered) or ZIKV^{8,9}. This lack of published studies does not allow evidence-based decision-making on public health policies. More clinical and epidemiological information regarding OROV is urgently needed. Especially in highly vulnerable areas, such as those where other arboviruses (CHIKV, ZIKV, DENV) are circulating because vector and climate conditions are suitable for transmission^{10–13}, research on OROV deserves more incentives among institutions, so that specific laboratory tests can be designed and more knowledge on this emerging arbovirus can be gathered properly^{2,10–13}. Currently, differential diagnosis of these arboviruses (CHIKV, DENV, ZIKV, MAYV) poses a significant challenge¹⁰, especially in the scenario of co-circulation and/or syndemics with

emerging and circulating arboviruses, or even in the scenario of co-infections^{10–13}.

In conclusion, Brazil is leading the initiative on OROV research. Besides this, international research networks should be expanded to gain a full understanding of this arboviral disease and explore its potential expansion and impact. To do this, the epidemic dispersion, transmission cycle, molecular epidemiology, pathogenesis, and clinical features of OROV need to be studied.

Data availability

Dataset 1: Raw data obtained from bibliographical databases (Medline, Scopus and SCI-E).

DOI, [10.5256/f1000research.10936.d1529494](https://doi.org/10.5256/f1000research.10936.d1529494)

Author contributions

Study design: AJRM. Data collection: CC, JACO, AMPB. Data analysis: AJRM, JACO. All authors were involved in the writing and read the final version submitted.

Competing interests

No competing interests were disclosed.

Grant information

This study was partially funded by the Universidad Tecnológica de Pereira (UTP), Pereira, Risaralda, Colombia. Presentation of this study at the IV Latin American Congress of Travel Medicine (SLAMVI), Buenos Aires, Argentina, October 6–7, 2016, was funded by CTO Colombia, UTP and the Latin American Society for Travel Medicine (SLAMVI).

The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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Luis Cuauhtémoc Haro-García

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The title of the manuscript seems to me appropriate, the summary is clear enough as to the purpose of the study. The design is adequate and sufficiently explained. The discussion chapter is balanced in such a way that it will be able to draw the attention of the scientific community on this emerging arbovirus in the region of Latin America.

Further Comments:

- If some of the contributions for non-Latin American countries (the United States, Canada, Australia, Norway, Thailand and others), were carried out in a Latin America country or in their own country, please say the reason for including them in the bibliometric analysis.
- Although the bibliometric analysis that was performed apparently fulfills the objective of the study ---but it includes results of non-Latin American countries---it would have been interesting to know if the scientific production of nations of other regions of the world share the concern they should be taking into account more the emergency and re-emergence of this arbovirus.
- It would be appropriate to discuss, by the authors, that Brazil probably is the main contributor to the issue because its budget for science is one of the highest in Latin America, and not because it suffers in a greater proportion of this problem, or if there are other reasons.
- It would have been desirable to consider some regional bibliographic databases such as LILACS and IMBIOMED, and not just English-speaking ones for a best bibliometric analysis, or to indicate why they were not taken into account.

I have read this submission and believe that I have the level of expertise to indicate that the study has the sufficient scientific standard

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Author Response 15 Mar 2017

Alfonso Rodriguez-Morales, Fundación Universitaria Autónoma de las Américas, Colombia

Dear Dr. Haro-García

Thanks for your comments.

The current bibliometric analysis was not restricted to Latin American countries, although this is an arbovirus that emerged in the region, there is interest from international groups to cooperate in the research on OROV from outside Latin America. Even more, Latin America can be the source of imported cases in North America and Europe, as has been happening not just with arboviral diseases, but specially with Chagas disease. When revising in bibliometric analysis such situation, also is see that there research groups outside Latin America contributing with this disease (Delgado-Osorio N, Vera-Polanía F, López-Isaza AF, Martínez-Pulgarín DF, Murillo-Abadía J, Muñoz-Urbano M, Cardona-Ospina JA, Bello R, Lagos-Grisales GJ, Villegas S, Rodríguez-Morales AJ. Bibliometric assessment of the contributions of literature on Chagas disease in Latin America and the Caribbean. Recent Pat Antiinfect Drug Discov 2014 Sep-Dec; 9(3):202-208). Then, countries such as USA, Canada, Spain, among others would be concerned about the potential impact of the spread of this arbovirus outside Latin America.

Certainly, we agree that Brazil probably is the main contributor to the issue because its budget for science is one of the highest in Latin America, and not necessarily because it suffers in a greater proportion of this problem. Nevertheless, OROV infection is a differential diagnosis in the Amazonas area of Brazil.

Finally, regard LILACS and IMBIOMED, the number of articles found in them is very limited. In the case of LILACS only 35 and at IMBIOMED none.

All these comments will be considered in the revised version that will corresponds to version 2 of this manuscript to be uploaded very soon.

Competing Interests: None.

Reviewer Report 02 March 2017

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The study is devoted to the bibliometric analysis of research published on the emerging pathogen Oropouche virus. The title of the article is totally appropriate, the abstract provides an adequate summary of the article. There is a comprehensive explanation of study design, methods and analysis used in the study. The conclusions are well balanced and justified on the basis of the results. All sufficient information is provided for replication of results described in the study.

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Author Response 02 Mar 2017

Alfonso Rodriguez-Morales, Fundación Universitaria Autónoma de las Américas, Colombia

Dear Dr. Kon

Thank you very much for your comments regard our Research Note on Bibliometrics of Oropouche virus.

Competing Interests: None.

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