



Rift valley fever: thematic analysis of documents indexed in the Web of Science Core Collection database

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Background: Rift Valley fever (RVF) is a viral disease associated with animals and humans. The prevalence of the RVF can cause an epidemic among vulnerable groups. This study aimed to offer a comprehensive review of RVF research productivity and assess the trends generated within the field of RVF using bibliometric analysis tools.

Methods: The research on RVF was collected from the Web of Science Core Collection (WoSCC) database. Data analysis and visualization were conducted using VOSviewer version 1.6.17 GraphPad v9.3.1.471 and Bibliometrix, an R package.

Results: A total of 1,098 documents (Articles & reviews) were identified from in 1931 to 2020, written by 3,383 authors, and published in 234 journals across 70 countries. Most articles were produced by the USA (n=381), France (n=97), and South Africa (n=72). Peters Clarence J from the USA was the most influential author with h-index 37, Bouloy Michele from France with h-index 31, and Paweska Janusz T from South Africa with h-index 21. The top published Journals were *PLoS Neglected Tropical Diseases Journal* and the *American Journal of Tropical Medicine and Hygiene*. Thematic analysis of the keyword shows that the hottest topic in RVF-related fields was mainly focused on three clusters transmission, infectious, and virus.

Conclusions: This is the first study applying a bibliometric analysis for RVF research. It serves as a starting point for professionals and academic researchers interested in RVF research identifying new avenues for future research hotspot and direction.

Keywords: Rift Valley fever (RVF); bibliometric analysis; VOSviewer; Web of Science Core Collection (WoSCC)

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Introduction

Rift Valley fever (RVF) is a neglected, mosquito-borne zoonotic disease (1,2). The RVF is considered a significant threat to global public health, severely

impacting agriculture, nutritional status, and other health vulnerabilities among humans and animals (2,3). The RVF belongs to the family of Bunyaviridae and the genus Phlebovirus (4), and the mosquito belonging to

the *Aedes* genus is a primary host for RVF viruses (5). RVF transmission mode is through mosquito bites and exposure to viremic blood, body fluids, or tissues of infected animals (1). The consequence of RVF is evidenced by a high increase in mortality and abortion rates of newborns during the life cycle of mosquitoes and virus replication (6). RVF outbreaks are primarily reported in sub-Saharan African (SSA) tropical and subtropical countries and are aggravated by climatic changes (7). Hightower *et al.* (2012) reported that RVF incidence was significantly associated with climate, rainfall, soil type, and land usage (8,9). Additionally, many mosquito species worldwide can cause biological transmission of Rift Valley fever virus (RVFV) (7). The recent epidemics reports showed that the prevalence of RVF would continue to expand in Africa (10-13).

Previous research on RVF focused on the prevalence of RVF in Kenya, Somalia, and Tanzania in December 2006 to April 2007, and 2008 (13), and Sudan in 2007, 2008, 2010, and 2013, which have harmed humans and animal health in the region (1,13,14). Recently, RVF has created broad-spectrum health and economic disadvantages, increasing human deaths and mortality rates for animals and humans in Africa. Furthermore, the epidemiology and transmission process through the metrological factors were proof of the disease prevalence (3). There is a need for more efforts to understand it's epidemiology and molecular biology (15).

The RVF public health risk will continue if adequate intervention and research are not implemented globally. While it is acknowledged that research has been conducted to explore the prevalence, it is pertinent to aggregate the research dimension to support future research. The consequence of RVF for the global population is morbidity and mortality (16). Without estimating the progress of research in the RVF field, the necessary scaling up and research policy required may lack. Therefore, aggregating for research trends, topical issues of RVF, and other associated social, environmental, climate, and health vulnerabilities can bridge the gap between researchers and global stakeholders to channel resources into the right direction (17,18).

The rationale for this research focuses on understanding the proliferation of research on RVF. No doubt, RVF has caused severe animal and human health consequences in affected regions. There is a need to accentuate the research conducted to understand the progress in eradicating the prevalence of the virus. The massive growth of scientific research and publications in recent decades and their collection of electronic databases has led to the use of bibliometrics as a valuable tool to measure scientific

research trends (19,20). The bibliometric study results usually provide policy support and intervention decision-making (21). Bibliometrics studies have been conducted for various diseases such as Ebola, Mycetoma, and Gum Arabic (22-24).

There is no study examining the trend and research scope of RVF to understand the progress in the domain. Therefore, this study examined the research trend of RVF to identify the most cited articles, authors, institutions, countries, journals, and content areas impacting the field. This study highlights global research outputs in the RVF literature in the Web of Science Core Collection (WoSCC) database.

Methods

Data source

We selected the Web of Science Core Collection (WoSCC) databases (<http://apps.webofknowledge.com/>) and have been widely used in previous studies of bibliometric analyses. We chose WoSCC because it is the world's leading scholarly bibliographic database. It provides comprehensive database coverage of the most extensive research in the sciences, social sciences, and arts and humanities and navigates the full citation network across many journals, books, and conference proceedings. For instance, WoSCC has numerous advantages over other databases such as Scopus and PubMed and offers more information on cited references, authors and author affiliations, citation, trends, and publication patterns during the data analysis.

Search strategy

Data were obtained from the online version WoSCC database of Thomson Reuters' (updated on 3 July 2021). In this study, the keyword used was "Rift Valley fever". The search was limited by three inclusions criteria: (I) articles published in the English language; (II) documents published as "Article OR Review", and (III) we searched in the WoSCC database from 1900 up to December 2020. Indexes: Science Citation Index-Expanded (SCI-EXPANDED) and Social Sciences Citation Index (SSCI) databases. The search terms used were developed by two authors who identified the top-cited papers on RVF and screening articles and carried out a subsequent analysis of the articles to ensure the consistency of retrieved documents included in the study. Our initial search generated 1,099 articles that met the selection criteria. The

Table 1 General characteristics of bibliometric search results

Description	Results
Timespan of reported publication	1931 to 2020
Sources (journals, books, etc.)	234
Documents	1,099
Organizations	975
Funding agencies	686
Countries	70
h-index	85
Sum of times cited	35,101
Without self-citation	16,423
Average years from publication	16.2
Average citations per document	31.94
Average citations per year per document	2.389
References	15,705
Document types	–
Article, n (%)	1,042 (94.8)
Review, n (%)	57 (5.2)
Document contents	–
Keywords plus	1,477
Author's keywords	1,206
Authors	3,383
Author appearances	6,824
Authors of single-authored documents	40
Authors of multi-authored documents	3,343
Authors collaboration	–
Single-authored documents	57
Documents per author	0.325
Authors per document	3.08
Co-Authors per documents	6.21
Collaboration index	3.21

additional related to the Journal Impact Factors (IF:2020) was manually performed and were taken from the Journal Citation Reports (<https://clarivate.com/products/journal-citation-reports/>). Bibliometric indicators include the year of publications, authors, institutions, journals, and funding agencies enhancing RVF research country collaboration. After ensuring the articles were relevant to our search, we

finally stored RVF documents as Excel.CSV or plain text or Bib text files for further analysis. Ethical approval was not necessary since the data were downloaded from the public databases.

Statistical analysis and mapping research themes

Data were analyzed using Bibliometrix, an R package to perform comprehensive science mapping analysis (25), and VOSviewer software version 1.6.17, released on July 22, 2021 (Leiden University, Leiden) was used for constructing and visualizing bibliometric networks (26). GraphPad v9.3.1.471 was used to run the correlation between the citations and study variables using the Spearman correlation coefficient. P values less than 0.05 were considered to be significant.

Results

Characteristic of articles and citations

A total of 1,099 articles on RVF were reported published from 1931 to 2020. Of the total, 1,042 (94.8%) were articles, and 57 (5.2%) were reviewed papers. The published documents were cited 35,101 times, with 16,423 without self-citation, 31.94 average citations per document, and 85 h-index, respectively (*Table 1*).

The annual growth rate of publications

A total of 1,099 records were retrieved from WoSCC using the query discussed in the methodology. The yearly growth over the past ninety years and the average of citations regarding EVF are shown in *Figure 1*. There is a steady increase in publications after 1990.

Top cited articles

As shown in *Table 2*, we listed the top ten most frequently cited papers (4,18,27-34) published in nine journals. The first most cited document is “Enzootic hepatitis or rift valley fever. An undescribed virus disease of sheep cattle and humans from East Africa” (4), was cited 543 times, followed by a paper titled ‘Rapid Detection and Quantification of RNA of Ebola and Marburg Viruses, Lassa Virus, Crimean-Congo Hemorrhagic Fever Virus, Rift Valley Fever Virus, Dengue Virus, and Yellow Fever Virus by Real-Time Reverse Transcription-PCR’ (27) have been cited 429 times.

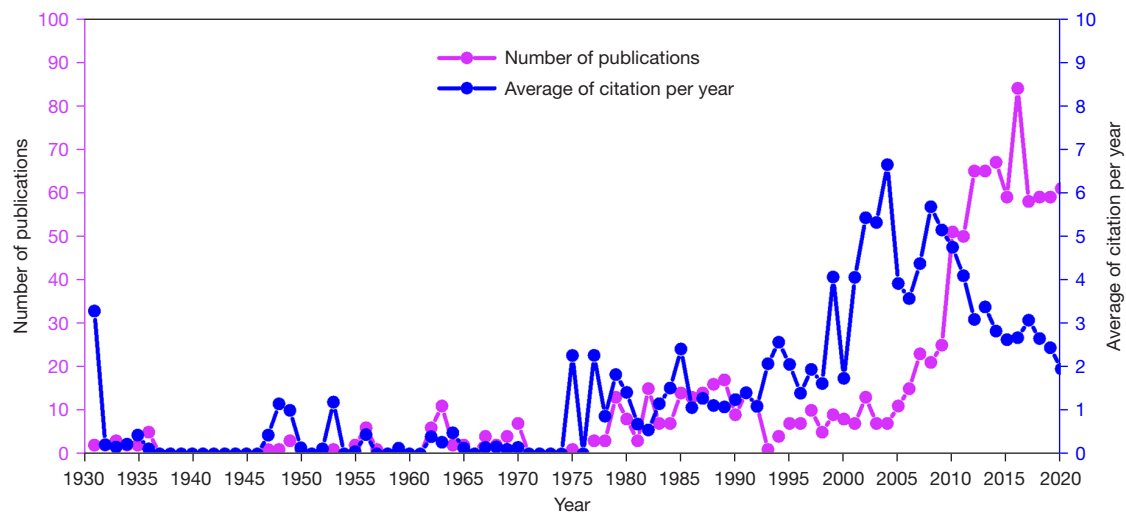


Figure 1 Number of publications per year and average of citation (MeanTCperYear) on RVF-related publications. RVF, Rift Valley fever. MeanTCperYear, average total citations per year.

Table 2 The 10 most cited manuscripts on RVF

Authors, year	Title of publications	Journal	TNC
Daubney <i>et al.</i> , 1931	Enzootic hepatitis or rift valley fever: an undescribed virus disease of sheep cattle and man from East Africa	<i>Journal of Pathology and Bacteriology</i>	543
Drosten <i>et al.</i> 2002	Rapid Detection and Quantification of RNA of Ebola and Marburg Viruses, Lassa Virus, Crimean-Congo Hemorrhagic Fever Virus, Rift Valley Fever Virus, Dengue Virus, and Yellow Fever Virus by Real-Time Reverse Transcription-PCR	<i>Journal of Clinical Microbiology</i>	429
Linthicum <i>et al.</i> 1999	Climate and satellite indicators to forecast rift valley fever epidemics in Kenya	<i>Science</i>	383
Pepin <i>et al.</i> , 2010	Rift Valley fever virus (Bunyaviridae: Phlebovirus): an update on pathogenesis, molecular epidemiology, vectors, diagnostics, and prevention	<i>Veterinary Research</i>	348
Linthicum <i>et al.</i> 1985	Rift Valley fever virus (family Bunyaviridae, genus Phlebovirus). Isolations from Diptera were collected during an inter-epizootic period in Kenya	<i>Journal of Hygiene</i>	305
Madani <i>et al.</i> 2003	Rift Valley fever epidemic in Saudi Arabia: epidemiological, clinical, and laboratory characteristics	<i>Clinical Infectious Diseases</i>	395
Meegan <i>et al.</i> , 1979	The Rift Valley fever epizootic in Egypt 1977-1978 1. Description of the epizootic and virological studies	<i>Transactions of the Royal Society of Tropical Medicine and Hygiene</i>	286
Bouloy <i>et al.</i> 2001	Genetic evidence for an interferon-antagonistic function of Rift Valley fever virus nonstructural protein NSs	<i>Journal of Virology</i>	269
Billecocq <i>et al.</i> , 2004	NSs protein of Rift Valley fever virus blocks interferon production by inhibiting host gene transcription	<i>Journal of Virology</i>	252
le may <i>et al.</i> , 2004	TFIIH Transcription Factor, a Target for the Rift Valley Hemorrhagic Fever Virus	<i>Cell</i>	221

RVF, Rift Valley fever; TNC, total number of citations.

Table 3 Active authors in RVF

Author (n=3,383)	Institutions*	h-index	TNC	TNP
Peters Clarence J	University of Texas Medical Branch Galveston Dept Microbiol & Immunol Galveston, TX, USA	37	3,838	69
Bouloy Michele	Inst Pasteur, Unite Genet Mol Bunyavirus, Paris, France	31	3,544	55
Paweska Janusz T	Natl Inst Communicable Dis, Special Pathogens Unit, Johannesburg, South Africa	21	1,377	48
Turell Michael J	United States Department of Defense, Virol Div Frederick, MD, USA	30	1,842	47
Ikegami Tetsuro	University of Texas Medical Branch Galveston Dept Pathol Galveston, TX, USA	21	1,612	39
Kortekaas Jeroen	Wageningen University & Research, Dept Virol & Mol Biol Ielystad, Netherlands	18	728	30
Morrill John	University of Cambridge, Selwyn Coll Cambridge, England	19	1,021	30
Nichol Stuart T	Centers for Disease Control & Prevention – USA, Div High Consequence Pathogens & Pathol ATLANTA, GA, USA	21	1,556	30
Sang Rosemary	Kenya Medical Research Institute Ctr Virus Res, Nairobi, Kenya	14	782	30
Linthicum Kenneth J	United States Department of Agriculture (USDA), Agr & Vet Entomol Gainesville, FL, USA	18	1,928	28

*, authors institutions data were manually obtained from Web of Science (updated on 28 December 2021). RVF, Rift Valley fever; h-index, Hirsch index or Hirsch number; TNC, total number of citations; TNP, total number of publications.

Active authors

Of 3,383 authors were contributed to RVF publication during the study period. The metric attempts to measure RVF articles' productivity and the citation impact of a researcher's publications such as total number of publication (TNP), total number of citations (TNC) and h-index cited and institution of each author (Table 3). Peters Clarence J from University of Texas Medical Branch Galveston Dept Microbiol & Immunol Galveston, TX, USA, with (h-index =37), had the most significant number of publications in the field of RVF. Bouloy Michele from the Inst Pasteur, Unite Genet Mol Bunyavirus, Paris, France, with (h-index =31); Paweska Janusz T from the Natl Inst Communicable Dis, Special Pathogens Unit, Johannesburg, South Africa, with (h-index =21) had also published a large number of articles on RVF field.

Active countries

The distribution of RVF articles according to corresponding author's country (CAC) and total number of citations are given in Table 4. The USA was the most productive country published (TNP =381) articles, followed by France (TNP =97) articles, and South Africa (TNP =72) articles. According to the total number of citations (NC) times, the USA is the most influential country based on the total citations score (TNC =12,964) times. International

Collaboration was reported between France, Kenya, the United Kingdom, Germany, and Senegal based on the ratio of Multiple country publications.

Active journals

There were 234 prestigious journals contributed to 1,099 articles published on RVF. *PLoS Neglected Tropical Diseases* produced the highest number of publications (TNP =78) articles, followed by the *American Journal of Tropical Medicine and Hygiene* with (TNP =69) articles, and the *Journal of Virology* (TNP =59) articles. According to the citation, the *Journal of Virology* received a high cited score of (TNC =3,768) times, followed by the *American Journal of Tropical Medicine and Hygiene* with (TNC =3,024) times (Table 5).

Active organizations and research areas

Approximately 30 Web of Science categories were reported. Among the top 10 areas of study, the majority of research was in virology 243 (22.13%), followed by infectious diseases 219 (19.92%), tropical medicine 201 (18.92%), and veterinary sciences 182 (16.56%). USA was reported among the top organization for research 126 (11.46%), followed by Institute Pasteur 107 (9.73%) and the University of Texas Medical Branch 63 (5.73%) as reported in Table 6.

Table 4 Country productivity of RVF

Country (n=70)	TNP	Freq	SCP	MCP	MCP_ratio	TNC [R]	AAC
USA	381	0.3950	279	102	0.2677	12,964 [1]	34.03
France	97	0.1006	39	58	0.5979*	3,810 [2]	39.28
South Africa	72	0.0746	51	21	0.2917	2,584 [3]	35.89
Kenya	52	0.0539	15	37	0.7115*	1,455 [5]	27.98
United Kingdom	43	0.0446	19	24	0.5581*	905 [7]	21.05
Germany	37	0.0383	14	23	0.6216*	1,964 [4]	53.08
Netherlands	29	0.0300	21	8	0.2759	763 [8]	26.31
Egypt	25	0.0259	20	5	0.2000	1,372 [6]	54.88
Spain	24	0.0249	16	8	0.3333	414 [10]	17.25
Senegal	21	0.0217	5	16	0.7619*	595 [9]	28.33

*, high international collaboration. RVF, Rift Valley fever; TNP, total number of publications; SCP, single country publications, MCP, multiple country publications; TNC, total number of citations; AAC, average of article citations.

Table 5 Productive journals on RVF

Journal (n=234)	h-index	TNC	TNP	IF (2020)	Research domain
<i>PIOS Neglected Tropical Diseases</i>	25	1,595	78	4.411	Infectious diseases parasitology tropical medicine
<i>American Journal of Tropical medicine and Hygiene</i>	34	3,024	69	2.345	Public, environmental & occupational health tropical medicine
<i>Journal of Virology</i>	38	3,768	59	5.103	Virology
<i>PIOS One</i>	17	781	43	3.24	Science & technology - other topics
<i>Vaccine</i>	23	1,502	37	3.641	Immunology research & experimental medicine
<i>Virology</i>	25	1,657	34	3.616	Virology
<i>Vector-Borne and Zoonotic Diseases</i>	15	664	31	2.133	Public, environmental & occupational health, infectious diseases
<i>Emerging Infectious Diseases</i>	19	1,314	30	6.883	Immunology, infectious disease
<i>Journal of Virological Methods</i>	16	732	27	2.014	Biochemistry & molecular biology, biotechnology & applied microbiology virology
<i>Journal of Medical Entomology</i>	15	725	22	2.278	Entomology, veterinary sciences

RVF, Rift Valley fever; h-index, Hirsch index or Hirsch number; TNC, total number of citations; TNP, total number of publications.

Funding agencies

The most fund for RVF research was came from the United States Department of Health Human Services 177 (16.10%), followed by National Institutes of Health NIH USA with 161 (14.64%), and NIH National Institute of Allergy Infectious Diseases NIAID with 122 (11.10%) among others (Table 7).

Correlation analysis

A statistically significant correlation was found between the number of articles produced by year and citations per year and number of publications ($r=0.821$; $P<0.0001$), and a number of authors and citations ($r=0.513$; $P<0.0001$), number of journals and citations times ($r=0.766$; $P<0.0001$), number of publication and total number of citations

Table 6 Top 10 most cited organizations and Web of Science categories on RVF

Web of Science categories (n=30)	NP (%)	h-index	Times cited	Organizations (n=975)	NP (%)	h-index	Times cited
Virology	243 (22.13)	59	9,938	The United States of America (USA)	126 (11.46)	45	6,280
Infectious diseases	219 (19.92)	37	5,500	Institute Pasteur	107 (9.73)	42	5,349
Tropical medicine	201 (18.28)	85	35,101	The University of Texas Medical Branch	63 (5.73)	24	1,580
Veterinary sciences	182 (16.56)	37	4,656	Centers for Disease Control and Prevention	53 (4.82)	34	3,586
Public environmental occupational health	172 (15.65)	43	6,459	National Institute for Communicable Diseases	43 (3.913)	23	1,570
Immunology	131 (11.93)	40	4,740	University of Pretoria	43 (3.913)	18	814
Parasitology	120 (10.91)	28	2,481	Centre de cooperation internationale en recherche agronomique pour le developement (CIRAD)	39 (3.55)	18	841
Microbiology	94 (8.55)	32	3,889	The University of the Witwatersrand	33 (3.00)	17	822
Multidisciplinary sciences	79 (7.18)	25	2,124	The Agricultural Research Service (ARS)	30 (2.73)	15	749
Biotechnology applied microbiology	62 (5.64)	24	1,701	Kansas State University	30 (2.73)	12	389

RVF, Rift Valley fever; NP, number of publications; h-index, Hirsch index or Hirsch number.

Table 7 Funding agencies

Record count	% of 1,099	Bar chart
United States Department of Health Human Services	177	16.10
National Institutes of Health NIH USA	161	14.64
NIH National Institute of Allergy Infectious Diseases NIAID	122	11.10
European Commission	89	8.09
United States Department of Homeland Security DHS	40	3.63
United States Department of Defense	29	2.64
UK Research Innovation UKRI	28	2.54
United States Department of Agriculture USDA	26	2.36
Wellcome Trust	24	2.18
German Research Foundation DFG	20	1.81
Medical Research Council UK MRC	19	1.72

Table 8 Factors influence the citations score on RVF publications

Study variables	Spearman correlation coefficient (r)	P value
Number of publications	0.821	<0.0001
Number of authors	0.513	<0.0001
Number of journals	0.766	<0.0001
Number of countries	0.934	<0.0001

RVF, Rift Valley fever.

between the reported countries ($r=0.934$; $P<0.0001$) as reported in *Table 8*.

The keyword analysis

The keyword analysis is one of the most important bibliometric indicators, as shown in *Figure 2*. The top 100 keywords plus were analyzed based on the frequency occurrence using word cloud. The topmost frequently

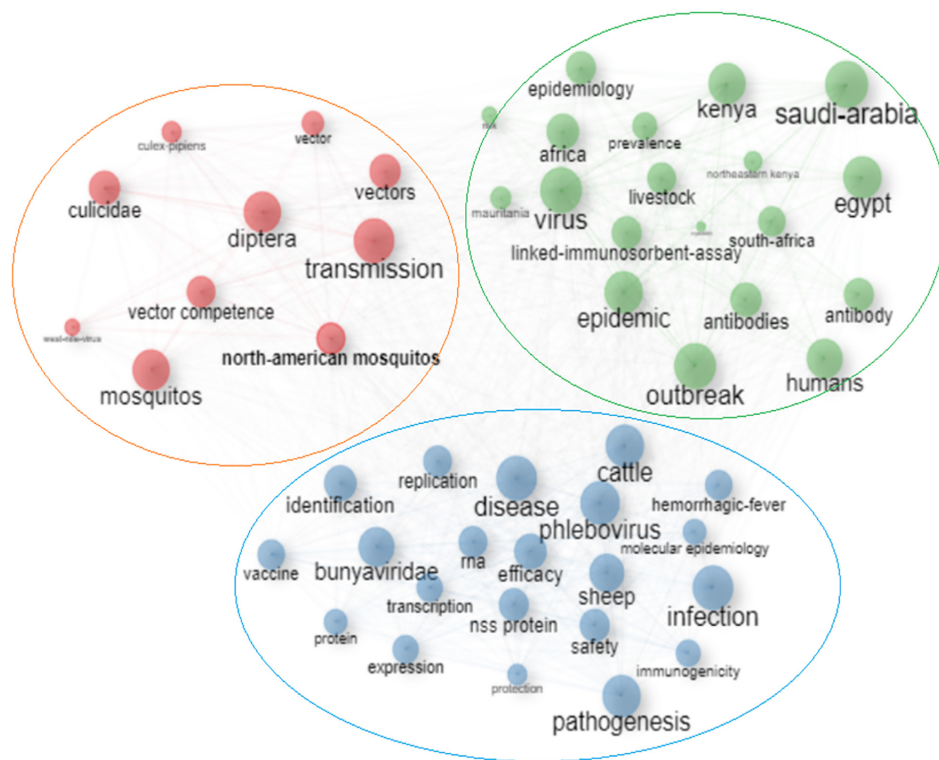


Figure 3 Thematic map of keyword plus for 50 words with minimum 12 keywords per cluster frequency (per thousand documents).

parameters used were the minimum number of 5 documents of an author was selected, which resulted in 233 authors meeting the thresholds. A total of 161 items are shown in the network with total links strength (TLS =2,184). Ikegami Testsure was reported with (TLS =113) Wilson, William C (TLS =79), and Nichol, Stuart T (TLS =67), among others (Figure 5A).

A minimum of 5 documents of an organization was selected, which resulted in 177 meeting the thresholds. The center for disease control and prevention (TLS =90), followed by Kenya Government Medical Research Center (TLS =78), The National Institute for Communicable Diseases (TLS =81), and Institute of Pasture (TLS =60), among other organizations, contributed to RVF research. The overlay visualization map of co-authorship and organization is plotted in Figure 5B.

A minimum of 5 documents per country for authors was selected, resulting in 42 meeting the thresholds. Only 42 items were shown in 8 clusters with (TLS =836). The leading countries based on the total links strength engaged in research are the USA (TLS =265), followed by Kenya (TLS =157), France (TLS =163), and Senegal (TLS =70),

among other countries, contributed to RVF research (Figure 5C).

Discussion

The current research displayed the global enormity of RVF and its potential to become a pandemic as it has already caused an epidemic in vulnerable regions. The disease surveillance has led to the understanding that RVF may spread across infection-free zones, especially in Europe, if an adequate global prevention strategy is not implemented (35). Similarly, RVF shows up in other research focusing on deadly top infectious disease pathogenic organisms (36), among the eight emerging WHO's outlined pathogens (37), travel medicine (38), and more recently, RVF is one of the diseases that are associated with global climate change (39). RVF is also evidenced to target placentas and causes abortion in multiple instances (40). All these shreds of evidence only resonate with the fatality capabilities of RVF. Given these glaring risks and empirical literature supporting the prevalence of RVF, there is still no known licensed vaccine against the infection (41).

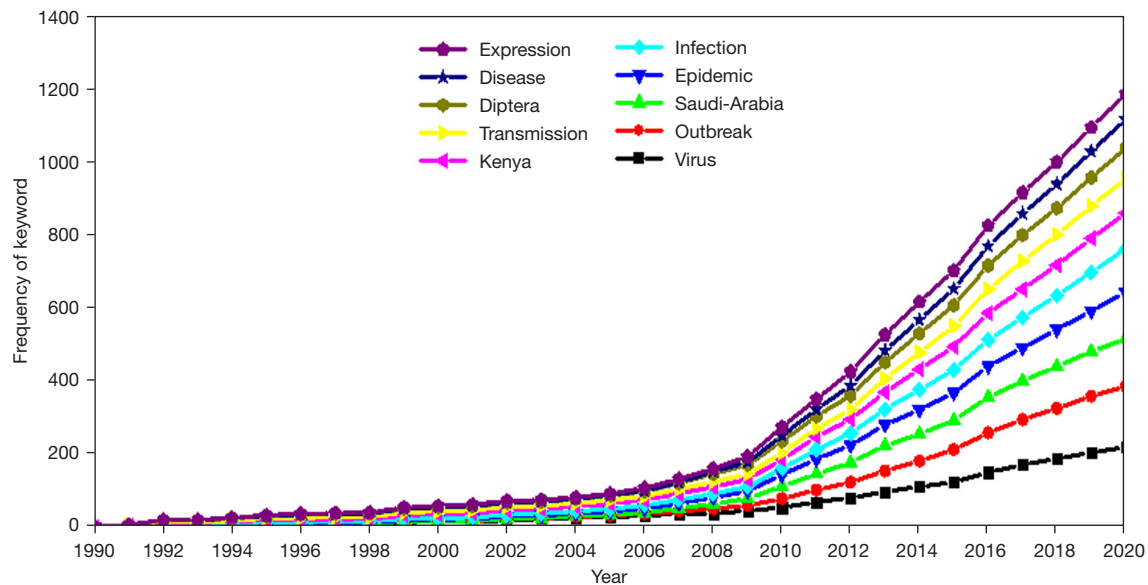


Figure 4 Annual change of topic on the RVF during the past years. RVF, Rift Valley fever.

Bibliometrics is a range of techniques and quantitative measures that analyze written publications and summarize the number of information and have become a part of academic life for researchers today (42). Thus, our research trend analysis using bibliometrics tools on RVF shows a significant dearth of progress in eradicating the diseases, which calls for global policy and health intervention. Many authors participated in publishing reviews and original articles on RVF in the last century. Although the evidence in the research trend shows increased citation between 2004 and 2005, the number of publications peaked in 2016. This evidence shows that research and awareness of RVF have risen in recent years but with a delve in citations. Thus, we found a positive association between the number of citations of RVF-related publications and the number of publications yearly.

The article with highest citations was for the article entitled “Enzootic hepatitis or rift valley fever. An undescribed virus disease of sheep cattle and humans from East Africa”, by Daubney *et al.* (1931) (4). In addition, the second most cited was the article entitled “Rapid Detection and Quantification of RNA of Ebola and Marburg Viruses, Lassa Virus, Crimean-Congo Hemorrhagic Fever Virus, RVF Virus, Dengue Virus, and Yellow Fever Virus by Real-Time Reverse Transcription-PCR”, published by Drosten *et al.* (2002) (27). These articles described virus disease reported in cattle, sheep cattle, and humans with challenges in diagnosing and

distinguishing among physicians (4,27). Furthermore, RVF outbreaks is significantly associated with climate factors in Africa, which may be the most critical issue that attracted much research (18).

Identifying the top ten journals among 232 peer-reviewed journals that published RVF documents can help libraries and researchers better identify the journals publishing more research in the RVF field. For example, many RVF publications were published in *PLoS Neglected Tropical Diseases* and *American Journal of Tropical Medicine and Hygiene*, indicating the quality of the leading journals in the RVF field that attract good papers in its field with a potential high-citation index as well as reported in previously (43). Impact factors and citations have become critical criteria in evaluating the career of scientists or new researchers or journals. Many authors attract the journals with high IF in selecting for their high-quality papers, whereas the specialty of journals is also important (44). The keywords analysis shows that bibliometric analysis is a valuable technique that makes it possible for the researcher to identify the scientific research production of the topic in any field (18,20,45-49).

The analyzed publications show that the leading corresponding authors’ countries were the USA, France, and four African countries. This evidence resonates with the progress in RVF research emanating from Africa has the research contribution has gained considerable global attention. However, the inter-state relationship mapping

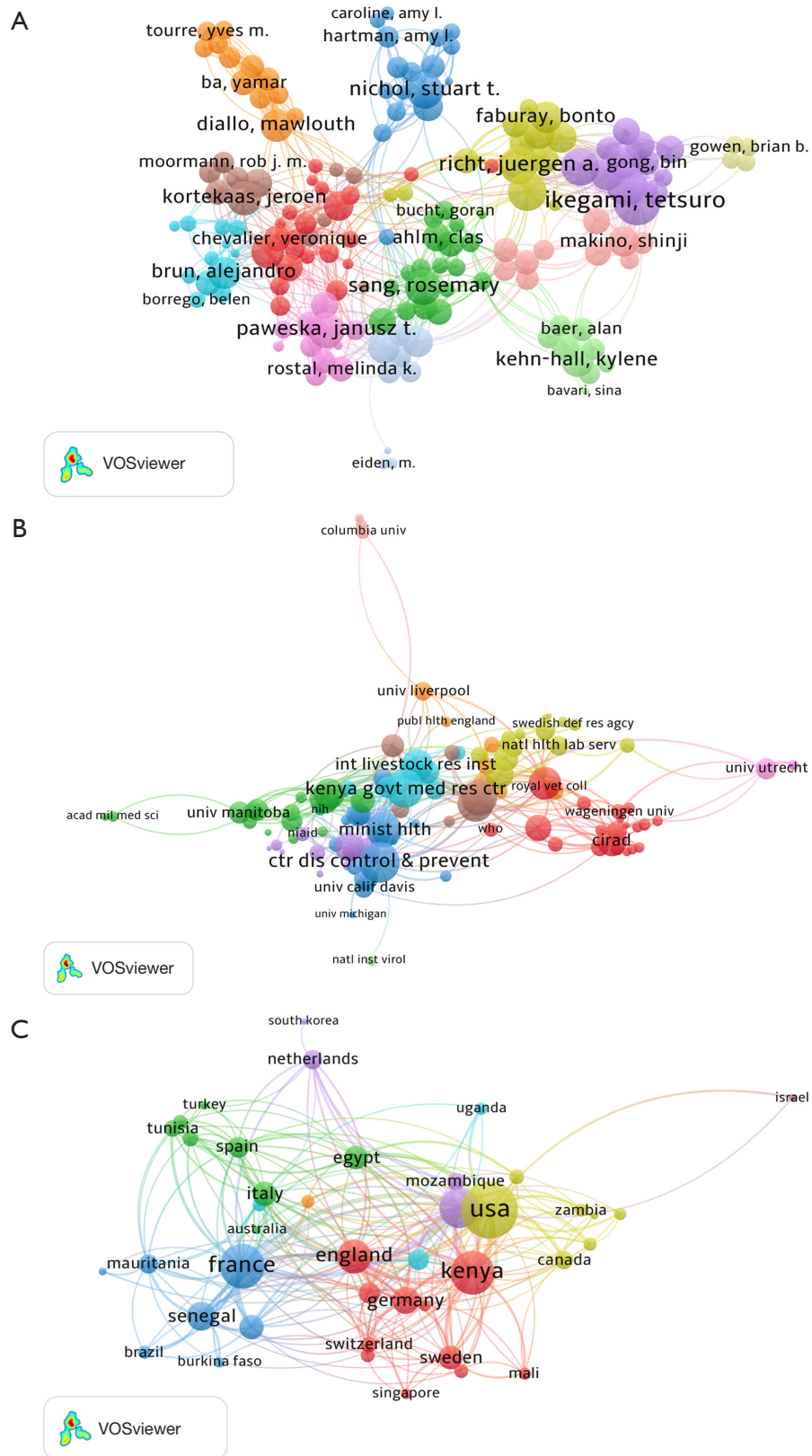


Figure 5 The analysis of co-authorship and authors (A), organizations (B), and countries (C), based on the TLS. TLS, total links strength.

shows that the United States, France, and Kenya have the most authorship and international collaboration on RVF-related research. The geographical contribution of researchers from the USA is growing strongly with the high contribution in publications. While South Africa, Kenya, Egypt, and Senegal still need to improve. South Africa is showing a substantial growth in publishing many RVF articles compared with other African countries. The results of the USA are particularly remarkable because in per capita levels compared with many other developed countries. The purpose of studying co-authorship and international collaborations between countries is to provide scholars interested in RVF topics with a different view and guide international studies.

Organizations and funding agencies continued to invest in scientific research. It is important to pay specific attention and acknowledge the efforts and funds to enhance research globally. Indeed, many funds for RVF research came from the United States because the availability of funding resources to the researchers in the USA may be high compared with other countries.

The limitation of the current study is that the publications extracted for analysis were from one database. We only used the WoSCC to search relevant literature on RVF, and we did not further search Google Scholar and Scopus to ensure that all relevant literature on the RVF topic was found. Furthermore, the enrolled articles were only English, where many publications published in other languages may be missed and not included in the analysis.

Practical implications

The RVF prevalence in SSA is enormous and requires significant research intervention. There is a shortage of research on vaccines and protection measures among the frontiers topics. This evidence calls for revamping research efforts to improve vaccine development for humans and animals. Although our study illustrates the bibliometric of the RVF literature and presents insights from the publication's growth over the past year, there is a need for potential opportunities for future research and collaboration between African regions compared with other regions.

Conclusions

Bibliometric study indicates an increasing number of RVF literature in the WoSCC. The study summarized the

authors' contributions, journals, countries, institutions, and organizations funding research. The keyword analysis has considerably influenced the research structure and development of RVF. Publication trends provide a historical perspective on scientific evolution, and the efforts and resources are dedicated to RVF globally. The study's novel approach shows remarkable progress in research, specifically in epidemiology, transmission, and vaccine through the clusters analysis. The diversity of highly cited authors of RVF publications in different institutions and countries proves the widespread evolution of research in the field. Active international collaborations have been established between researchers in countries like the USA, France, Kenya, UK, Germany, and Senegal.

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Footnote

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <https://aoi.amegroups.com/article/view/10.21037/aoi-21-9/coif>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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