

Health-related publications on fragile states in the alert zone: a bibliometric analysis

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Research

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Abstract

Background

Vulnerable and fragile settings is global health challenge. Assessing health research activity can help identify neglected health domains in fragile settings. The objective of the current study was to assess and describe health research activity on fragile states in the alert zone.

Method

A bibliometric method was applied using SciVerse Scopus. Research articles published on fragile states in the alert zone were retrieved and analyzed. The Fragile State Index (FSI) score was used for selection of states in the alert zone. The analysis was limited to one year; 2018.

Results

The search query found 2299 research articles giving an average of 2 research articles per one million people per year in the selected fragile states. The number of research articles per one million population was not significantly correlated ($p=0.053$; $r= - 0.349$) with FSI scores. However, it was significantly correlated with the extent of international research collaboration ($P<0.01$, $r=0.65$). Research on communicable diseases was the largest research domain (763 articles; 33.2%) followed by maternal/women's health (430 articles; 18.7%), non-communicable diseases (291 articles; 12.7%), health system/policy (271 articles; 11.8%) and psychosocial and mental health (89; 3.9%). The top ten cited articles were mainly on infectious diseases, particularly on malaria and Lassa fever. Of all the retrieved documents, 727 (31.6%) research articles appeared in national/regional journals while the remaining appeared in international journals. The World Health organization was the most active funding organization for research on fragile states. Top ten active institutions were mainly based in fragile states with the lowest FSI score, specifically Ethiopia, Uganda, Nigeria, and Pakistan.

Conclusion

Research on fragile states was relatively low. Research on mental health and health system/policy should be encouraged. Collaboration and funding might help academic institutions in fragile states to make health problems in these countries more visible

Background

According to Organization for Economic Co-operation and Development, a fragile state is defined as a state of poor governance and limited ability to deliver the most basic services to its citizens [1]. Fragile states suffer from a situation of war or humanitarian and natural crises or extreme poverty or internal conflict or post-conflict reconstruction phase [2, 3]. Fragile states need technical and financial support from the international community in order to face the challenges linked to fragility and to help these states achieve the sustainable development goals [4]. Strengthening and building resilient health systems

in fragile states is important for global health security agendas since serious disease outbreaks might affect the whole world [5]. Investment of high-income countries in health infrastructure and research capacity building in fragile countries is believed to strengthen global health security [6, 7] and limit and decrease international violence and terrorism [8, 9]. Fragile States Index (FSI) is a tool developed to measure fragility based on 12 indicators that measure cohesion, economic, social, and political vulnerability of any country [10]. The primary purpose of FSI is to assess the vulnerability of all sovereign states that are members of the United Nations with the exception of Taiwan, Kosovo, Western Sahara, Northern Cyprus, and the Palestinian Territories. The score for FSI ranges from 0 to 120. Countries with a score above 90 are termed alert group. The World Health Organization (WHO) released the top ten health threats in 2019 that included one about vulnerable and fragile settings where more than 1.6 billion people live in places with combination of challenges such as drought, famine, conflict, population displacement, and weak health services which leave them without access to basic care [11].

Building a strong state requires strengthening health system and health research capabilities of professionals in that state. Fragile states have weak and broken health systems with limited human resources and infrastructure needed to survey the health situation and expose serious urgent gaps to international community to recruit technical and financial support toward these urgent health gaps. The objective of the current study was to carry out a quantitative and qualitative analysis of health-related articles published in 2018 on people living in countries in the alert zone (i.e. FSI > 90). The analysis aimed to shed light on research domains, status of research collaboration, and key players in publishing the retrieved articles. A literature search using Google Scholar showed that several research articles have been published on the health status of certain countries in the alert zone [12, 13]. However, none was carried out to map important health issues in fragile states in the alert zone. The current study will serve (1) research and health institutions interested in global health security to better assess research on fragile states [14]; (2) international health agencies to allocate research gaps in these fragile states and tailor health support and health aids based on the identified gaps; (3) international funding agencies to strengthen health systems in most neglected health aspects [15, 16]; and (4) create and encourage research collaboration with colleagues in fragile states to rebuild the health research capabilities [17].

Method

Database used

The database used to accomplish the objective of the current study was SciVerse Scopus. The choice of Scopus was made because it is larger and more comprehensive than Web of Science (WoS) and Medline [18]. Scopus has approximately 23000 indexed peer-reviewed journals in all scientific disciplines compared with approximately 13000 indexed peer-reviewed journals in WoS.

Search strategy

The approach used to retrieve the health-related publications was based on the following five steps (Appendix 1):

1. The list of countries selected to be part of the study were those in the alert zone (i.e. FSI > 90) according to the FSI score published in 2019 [10]. The number of countries in the alert zone was 31 and most of them were in the African and Eastern Mediterranean regions. The range of FSI scores was from 113.5 for Yemen to 90.1 for Mauritania. All countries in the 2019 alert zone had been in this zone for at least ten times in the past 15 years.
2. Names/adjectives of the thirty-one fragile states in the alert zone were entered in the advanced search of Scopus search tool. The name of the countries was listed in title search to make sure that the study was carried out in the vulnerable setting of the fragile state. The search strategy was not designed to retrieve documents published by authors from the alert countries. We were interested in documents discussing health issues in fragile states regardless of the affiliation of the author(s) and that is why we used the title search strategy rather than the affiliation strategy.
3. Exclude false positive documents such as:
 - a. Documents on "aspergillus Niger" or "Sudan dye" or "guinea pigs" which might be mistakenly counted as country name for Niger or Sudan or Guinea.
 - b. Documents about refugees or migrants living outside their countries because the focus of the current study was on the health status of people living in the fragile states and not refugees living in Europe or north America or Australia.
 - c. Documents on non-human health. Therefore, documents about dogs, horses, and plant diseases were excluded.
 - d. Documents in all subject areas (EXCEPT subject area of medicine). Therefore, documents in subjects' areas such as agriculture, environment, social science, humanities, chemistry, physics, mathematics, astronomy, arts, economics, business, education, and biomedical sciences (basic microbiology, immunology, pharmacology, biochemistry, and molecular biology) were excluded. Documents in the basic biomedical sciences were excluded because the major interest in the current study was on health publications relevant to the public health where immediate intervention can be of value to the people living in fragile states.
 - e. Documents on U.S soldiers deployed in Iraq or Afghanistan.

The exclusion steps were made based on manual search of the top 200 cited documents. Whenever an irrelevant document was found, an exclusion step was added.

4. Limit type of documents to "research articles". Therefore, reviews, letters, books, notes and editorials were all excluded. We were interested only in research articles since they represent true research.
5. Limit study period to one year; 2018. The study period was limited to one year since the number of publications on the selected fragile states was large enough to give a picture on the research themes and important topics being discussed. Furthermore, the choice of 2018 was made to avoid bias. The list of 31 fragile states in the alert zone was published in 2019 based on data available from these countries in the years before. Therefore, the selection of 2018 as the year of study will create less error in data analysis.

Validation of search strategy

The search strategy was validated to ensure minimum irrelevant and maximum relevant documents. The validation method applied was similar to that used in previously published method [19]. In short, the top 200 cited documents in the retrieved literature were reviewed to make sure that all are within the human health domain and were carried out in the listed fragile states. Whenever a false positive result was found, the search strategy was changed to eliminate the false-positive results. The authors kept excluding irrelevant keywords until the top 200 cited documents were free of any false-positive results. However, this step alone is inadequate for validation and a second step was implemented to make sure that the search strategy retrieved the maximum number of relevant documents. The second step utilized the number of publications authored by each of the top ten active authors and compared it with the number of publications by the same authors obtained from their personal file in Scopus. The result of the Pearson correlation test was significant with higher correlation value (> 95%) suggesting that there were minimum false-negative results.

Data Export

The retrieved data in Scopus was exported to Microsoft excel for presentation. The exported data included: annual number of publications, names of journals publishing the retrieved documents, and institutions publishing the retrieved documents, names of funding agencies. For each variable, only the top active ten was presented in the manuscript. For example, the top ten active journals and institutions were presented. All analysis and data export were carried out on the same day (January 10, 2020) to avoid misinterpretation.

Research domains

The retrieved documents were analyzed to find the number of documents on infectious diseases, health system, psychosocial and mental health, women/maternal health, and non-communicable diseases. The number for each theme was obtained by adding specific keywords after the main search query. For example, in case of the health system research theme we used the following keywords: title ("health system" or "health policy" or "health service*" or "access to medicine*" or "access to medication*" or "access to health*" or "barrier* to health*" or "health plan*" or "health* facilit*" or "health insurance" or "medical insurance" or "health strategy" or "health* preparedness" or "health coverage" or "health regulation*" or "medical system" or "sanitation system" or "medical profession" or "nursing satisfaction" or "medical law" or "health plan*" or "medical profession" or "health profession" or "operating room" or "surgical facility" or "surgical care" or "surg* theater") or journal name ("health system" or "health service" or "health policy"). Appendix 2 shows the search query used to retrieve the various research domains.

Graphics and mapping

International research collaboration among top ten active countries was visualized using VOSviewer [20]. In the map, the thickness of the connecting line between any two countries is called link strength which is proportional to strength of research collaboration. The greater the thickness, the stronger the research

collaboration. The map also gives the total strength of research collaboration (Total link strength = TLS) which is an indicator of the overall research collaboration for each country relative to other countries.

Quality of publications

The quality or impact of the journal was measured using the quartile ranking obtained from Scimago journal rank. Journals in the Q1 rank are considered to have the highest impact while those in the Q4 had the least impact.

Results

Volume and research productivity

The search query found 2299 research articles. A total of 1607 (69.9%) research articles were funded. The WHO ranked first (69 articles; 3.0%) as a funding agency. The total number of populations in the thirty-one fragile states was 1152 million. Therefore, the number of retrieved articles was equivalent to 2 research articles per one million population. The retrieved articles received 3660 citations, a mean of 1.6 citations per document per year. Table 1 shows the list of thirty-one fragile states with the number of research articles published on each fragile state with the corresponding number of research articles per one million population. The number of research articles per one million for each country was not significantly correlated ($p = 0.053$; $r = -0.349$) with FSI scores. However, there was a general trend of lesser number of health publications per one million inhabitants in countries with higher FSI score. The country which had the highest number of articles per one million population was Uganda followed by Kenya and the Republic of Congo with 6.7, 5.7, and 5.6 research articles per one million respectively. On the other hand, North Korea and Congo D. R had the least number of publications with 0.1 and 0.4 research articles per one million population. When the same search strategy was applied to Qatar, the result was 250 publications in 2018, equivalent to 96 research articles per one million population. For Kuwait, it was 77.4 research articles per one million population. For Bahrain, it was 65.3 research articles per one million population.

Due to technical limitations, Table 1 is provided in the Supplementary Files section.

Research domains

Analysis of retrieved articles showed that 763 (33.2%) were within infectious diseases, 430 (18.7%) were within maternal/women's health, 291 (12.7%) were about non-communicable diseases (including nutrition disorders), 271 (11.8%) were within health system/policy, and 89 (3.9%) were on psychosocial and mental health (Table 2). The remaining were in miscellaneous subjects as complementary/alternative medicine, chemical weapons in Syria, and general public/environmental health.

Table 2
Research domains in the retrieved articles

Research domain	Number of articles	% (N = 2299)
Infectious diseases	763	33.2
Maternal and women's health	430	18.7
Non-Communicable diseases	291	12.7
Health system/policy	271	11.8
Psychosocial and mental health	89	3.9

Top ten cited research articles

The list of top ten cited research articles included nine about infectious diseases and one about stroke. Four of the top ten cited research articles discussed malaria and two discussed Lassa fever. The other discussed infections such as Ebola, Cholera, and Onchocerciasis. The top ten cited articles were published in high impact journals, particularly The Lancet [21–30].

Top ten active journals

Table 3 shows the names of top 10 active journals that have been involved in publishing the retrieved documents. The top ten journals published 642 (27.9%) articles. Two of the top ten active journals were within the scope of infectious diseases, one was in the field of maternal health, one was in the field of health services, and the remaining were in the field of general medicine/public health. Four of the top ten active journals were national or regional journals while the remaining were international journals. The national and regional journals were Pan African Medical Journal, African Health Sciences, Ethiopian Journal of Health Sciences, and Journal of the Pakistan Medical Association. The journal that published the most was the Pan African Medical Journal (104 articles; 4.5%). All international journals in the top ten active list ranked Q1 while the national/regional journals ranked Q3 or Q2. Of all the retrieved documents, 727 (31.6%) articles were published in national/regional journals while the remaining were published in international journals.

Table 3

Top ten active journals in publishing health – related research articles on fragile states

Rank	Journal	Frequency	% (N = 2299)	Subject area	Journal Rank	Country of the journal
1	Pan African Medical Journal	104	4.5	Medicine (miscellaneous)	Q3	Kenya
2	BMC Public Health	93	4.0	Medicine (Public Health, Environmental and Occupational Health)	Q1	UK
3	BMC Pregnancy and Childbirth	71	3.1	Medicine (Obstetrics and Gynecology)	Q1	UK
4	BMC Infectious Diseases	67	2.9	Medicine (Infectious Diseases)	Q1	UK
5	Journal of The Pakistan Medical Association	64	2.8	Medicine (miscellaneous)	Q3	Pakistan
6	Plos Neglected Tropical Diseases	57	2.5	Medicine (Infectious Diseases Public Health, Environmental and Occupational Health)	Q1	USA
7	Ethiopian Journal of Health Sciences	53	2.3	Medicine (miscellaneous)	Q3	Ethiopia
8	BMC Health Services Research	48	2.1	Medicine (Health Policy)	Q1	UK
9	BMJ Open	46	2.0	Medicine (miscellaneous)	Q1	UK
10	African Health Sciences	39	1.7	Medicine (miscellaneous)	Q2	Uganda

Q = quartile. Q1 is the highest and Q4 is the lowest rank. The rank was obtained from Scimago Journal Rank (<https://www.scimagojr.com/>)

International research collaboration

International research collaboration among top ten active countries was visualized (Fig. 1). Five of the top ten active countries belonged to fragile states (Pakistan, Ethiopia, Uganda, Cameroon, Nigeria) while the remaining five were USA, UK, Australia, Canada, South Africa. The strongest research collaboration was between the USA and Uganda (TLS = 136) followed by that between the USA and Nigeria (TLS = 74). The extent of international research collaboration for each country in the fragile state list was presented as TLS in Table 1. There was a strong positive and significant correlation between the number of

publications per one million for each fragile state and the strength of international research collaboration (Pearson correlation test: $r = 0.65$, $p < 0.01$).

Top ten active institutions

The top ten active institutions/organizations involved in publishing the retrieved documents were shown in Table 4. The WHO and the London School of Hygiene & Tropical Medicine were the only institutions/organizations not based in the fragile states while the remaining eight were based in the fragile states particularly in Ethiopia, Nigeria, Uganda, and Pakistan.

Table 4

Top ten active institutions/organizations involved in publishing health – related research articles on fragile states

Rank	Institution/ Organization	Number of publications	Frequency (N = 2299)	Country
1	Makerere University	152	6.6	Uganda
2	Addis Ababa University	144	6.3	Ethiopia
3	University of Gondar	113	4.9	Ethiopia
4	London School of Hygiene & Tropical Medicine	97	4.2	UK
5	University of Nigeria	76	3.3	Nigeria
5	Organisation Mondiale de la Santé	76	3.3	WHO
7	University of Ibadan	69	3.0	Nigeria
8	Bahar Dar University	56	2.4	Ethiopia
8	Jimma University	56	2.4	Ethiopia
10	The Aga Khan University	52	2.3	Pakistan

Discussion

The current study aimed to describe and analyze health-related publication on countries listed in the alert zone based on the FSI scores. Vulnerable and fragile setting is considered by the WHO as one of the top ten global health threats in 2019 [11]. Therefore, shedding light on health research on fragile states is justifiable and in support of the WHO vision to tighten global security by minimizing or eradicating sources of health threat.

The current study showed relatively limited volume of health-related publications on people living in the selected fragile states. This might reflect a lack of adequate international research interest on health

situation in these countries. It is possible that security problems hinder researchers from developed countries to participate in health studies about fragile states. The research capacity in fragile might also be limited by the lack of adequate infrastructure or human resources which further limit potential research collaboration with researchers from developed countries. Fragile states might lack the infrastructure needed to educate and train health professionals to develop medical skills and research capacities [31, 32]. Large number of people in these countries is needed to expose all health aspects and guide the international community in their future intervention.

The current study showed limited number of publications in psychosocial and mental health field on people living in fragile states. Poverty, substance abuse, and violence against women are associated with fragile and vulnerable settings [33]. A recent systematic review suggested that both depression and post-traumatic stress disorder were highly prevalent in war survivors who stayed areas of conflict [34–36]. Even refugees who live abroad continue to suffer mental health problems due to the horrific sciences and scary journey to safe places [37]. The state of war and conflict reflects negatively on the mental health of children and women [38]. Therefore, upgrading mental health services and directing research toward mental health problems in children, women, and elderly are highly needed [38]. Furthermore, interventions by the national health authorities or international health organizations should focus on these vulnerable groups using cost-effective and sharing techniques [39–41].

The current study also showed that research on health policy/system constituted less than 12% of the retrieved literature despite that health system in fragile states is poorly functioning. Developed and resilient health systems in any country is the guarantee for minimizing health-related aspects of outbreaks or natural disasters [14, 42]. The Ebola crisis in certain areas in Africa is a strong example of how weak health systems in fragile countries could not face and contain a serious disaster or infectious outbreak [43, 44]. Research that points out aspects of weakness of health system/services/policies in fragile countries might help international and national funding authorities to fill the gaps and build sustainable health systems in fragile states [45, 46]. The Health Systems Global Conference series had emphasized the importance of research on resilience and fragility as a lesson learned from Ebola crisis. Achieving a strong and resilient health system in fragile states is an important step in building a strong state. Furthermore, building strong health systems and services in fragile states will minimize maternal death and will improve health services to mothers and to patients with chronic diseases. The current study showed that the volume of research on NCD as well as on maternal/women's health was next to that of infectious diseases. According to the United Nation Population Fund, in 2015 the maternal mortality in countries affected by humanitarian crisis due to conflict was 417 per 100,000 live births, which is 1.9 times higher than the global estimate of 216 [47]. Closing the gap requires involvement of private sector as well as international organizations to address maternal and neonatal health services in fragile states.

Research on infectious diseases had the largest number of publications. The current study showed most research interest was directed toward malaria and infections that had an immediate potential for a global outbreak such as Ebola or Lassa fever. Early detection of infectious disease outbreaks is important for

global health security. A review article on fragile states recommended implementing infectious disease surveillance to enhance detection of outbreaks [48]. Research on other serious and common infection must be encouraged. Tuberculosis is a well-known infection in poor countries killing approximately 1.5 million people in 2018 [49]. The eradication of TB by 2030 requires elimination of certain pockets in fragile states such as Pakistan, Afghanistan, and Nigeria [49, 50]. Helminthiasis, scabies, schistosomiasis, enteric bacterial and parasitic infections, as well as many other types of infections are common in poor communities and research on these infections are also needed [51]. Therefore, more research efforts, funding, collaboration should be directed toward infectious diseases that do not pose an immediate threat to developed countries. Furthermore, research on fragile states with FSI score above 100 (very high and high alert zone) such as Yemen need to be strengthened. Conflict in Yemen has generated several infectious disease outbreaks such as cholera and diphtheria which can cause mass fatalities [52–54]. The same applies to the situation in Syria where health teams and health facilities have been attacked in addition to the threat of chemical weapons [55–58].

Certain fragile states had received a good number of publications. Most of these countries, e.g. Uganda, Nigeria, Pakistan, Congo, and Cameroon had an FSI score below 100. Despite that, gaps in certain research domains have been found. For example, more research on psychosocial and mental health research domain is needed since the volume of research on this domain was the minimum. Another potential reason for the reasonable contribution of these fragile states is the presence of academic institution with medical facilities and health – related journals indexed in Scopus. Authors in these countries had better chance than authors in other fragile states to disseminate their research observations in local journals. It is important for the international community to support these academic journals to make local research in fragile states more visible to international health and political communities.

Limitation

This was a bibliometric analysis that used the FSI score for inclusion of countries. However, the FSI score might not be the perfect indicator of fragility and therefore the results obtained in this study should be interpreted based on the methodology adopted to calculate the FSI score [59]. In the current study, we used the title search for all selected countries to find the volume and pattern of publications on people living in the selected fragile states. This methodology might not be a perfect one but it is the most feasible and the most accurate. Using affiliation strategy will retrieve large number of publications that are irrelevant to people living in fragile states.

Conclusion

The volume of publications on fragile states was relatively low suggesting that people in these countries did not receive adequate attention from a research aspect. The largest research domain of interest on these countries was infectious diseases with emphasis on infections with potential global threat. Psychosocial and mental health research domain was under-represented. The same applies to health system research. Research funding and collaboration to address these research domains are required.

Abbreviations

WHO

World Health Organization

FSI

Fragile State Index

Q1

First Quartile

Declarations

Ethics Approval and Consent to Participate: Not applicable

IRB at An-Najah National University, Palestine requires no approval for bibliometric studies

Consent for publication: Not applicable

Availability of data and materials: all data presented in this manuscript are available on Scopus database using the search query listed in the methodology section.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions: W.S started the idea, designed the methodology; did the data analysis, graphics, and data interpretation; wrote and submitted the manuscript.

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Figures

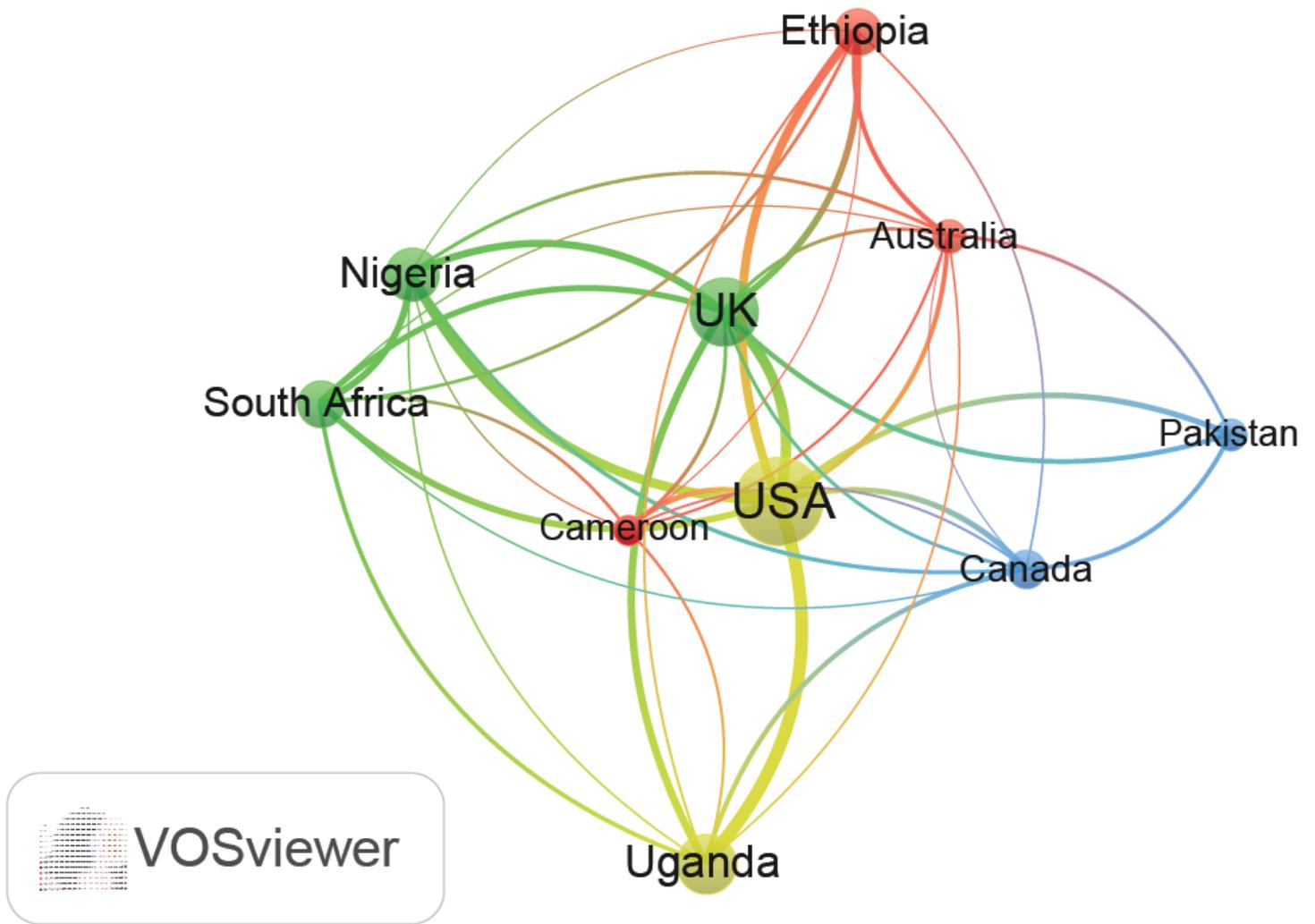


Figure 1

Visualization of international research collaboration among top ten countries involved in publishing health – related research on fragile states. The thickness of any connecting line is a measure of research collaboration and termed link strength. The total research collaboration for any specific country in the map is termed Total Link Strength (TLS). Countries with larger node size has higher TLS value. Countries with similar node color have close research interest.

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