Research Article

Bibliometric Analysis of Ebola Research Indexed in Web of Science and Scopus (2010-2020)

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Background. Within the past decade, Africa has faced several recurrent outbreaks of Ebola virus disease (EVD), including the 2014-2016 outbreak in West Africa and the recent 2018-2020 Kivu outbreak in the Democratic Republic of Congo. The study thus aimed at quantifying and mapping the scientific output of EVD research published within 2010-2020 though a bibliometric perspective.

Methods. EVD-related publications from 2010 to 2020 were retrieved from the Web of Science (WoS) and Scopus databases by using the keywords 'Ebola', 'Ebola Virus Disease', 'Ebolas', and 'ebolavirus'. Biblioshiny software (using R-studio cloud) was used to categorise and evaluate authors’, countries’ and journals’ contribution. VOSviewer was used for network visualisation.

Results. According to the used search strategy, a total of 3865 and 3848 EVD documents were published in WoS and Scopus, respectively. The average citation per document was 16.1 (WoS) and 16.3 (Scopus). The results show an overall increase in the publication trend within the study period. The leading countries in EVD research were the USA and UK, with over 100 papers in both databases, including Nigeria and South Africa. NIAID and CDC-USA were the most influential institutions, while "Infectious Diseases" and "Medicine" were the most decisive research fields. The most contributing authors included Feldmann H and Qiu XG with over 60 papers in each database, while Journal of Infectious Diseases was the most crucial journal. The most cited article was from Aylward et al. published in 2014, while recent years displayed a keyword focus on "double-blind", "eficacy", "ring vaccination" and "drug effect".

Conclusion. This bibliometric analysis provides an updated historical perspective of progress in EVD research and has highlighted the role played by various stakeholders. However, the contribution of African countries and institutions is not sufficiently reflected, implying a need for increased funding and focus on EVD research for effective prevention and control.

1. Introduction

Ebola virus disease (EVD) is a multifaceted zoonosis that is highly infectious in humans [1]. Ebola viruses that cause EVD are negative-stranded RNA viruses, belonging to the Filoviridae family and are endemic to regions of the west and equatorial Africa [2]. The first EVD human case was identified in 1976 in Zaire, the now called Democratic Republic of Cong-DRC [3]. Ebola virus is transmitted among humans via close and direct physical contact [4], and the animal-to-human transmission has been reported when people come into contact with tissues and bodily fluids of infected animals [3, 5].

Within the past ten years, Africa has faced several recurrent outbreaks of EVD, with case fatality rates, usually around 25–90% [1, 2]. Besides the 2014-2016 Ebola outbreak in West Africa, which claimed more than 1000 victims, Africa has been again stricken with the recent 2018-2020 Kivu Ebola outbreak in the DRC [6, 7]. This epidemic was caused by the Zaire ebolavirus species, which is the most...
lethal strain of the six known Ebola virus substrains [8]. On 17th July 2019, World Health Organisation (WHO) announced the Kivu outbreak as a "Public Health Emergency of International Concern (PHEIC)" [9]. By 16th December 2019, 3,348 cases and 2,210 deaths, including 161 healthcare workers, had been reported, with a fatality rate of 66% [6]. The overwhelming socioeconomic effects of this outbreak put the global health response in acute focus, with the potential of spreading to neighbouring countries [10].

The Government and the Ministry of Health (MoH) of DRC, WHO, and partners have tirelessly implemented several outbreak control interventions. However, the implementation of response measures remains a key challenge due to the prolonged humanitarian crisis in North Kivu province, the unstable security situation, and the mistrust of affected communities in response activities [7, 11]. Current evidence links the severity of the Ebola outbreak to the type of Ebola species involved. The Ebola Zaire and Ebola Sudan species are the most pathogenic, while Ebola Bundibugyo species appears to have a lower case fatality rate [2, 12].

Africa, within Ebola history, has witnessed serious outbreaks in the last decade, facilitating great research output. Besides, although EVD mainly affects Africa, it is a critical global health issue, which if not effectively controlled, could easily be exported all over the globe [13, 14]. This raises the need to collectively quantify and evaluate EVD research and give an updated historical perspective, owing to the considerable efforts and resources that have been injected into the control, treatment, and prevention of EVD. This study is thus aimed at mapping research efforts related to the Ebola virus disease published within 2010-2020 through a bibliometric perspective using documents indexed in the Web of Science and Scopus databases.

2. Materials and Methods

2.1. Study design. This study used a bibliometric analysis, a technic that has been progressively used as a tool and basis for monitoring research performance of various scientific disciplines, as well as supporting appropriate policy actions [15–17].

2.2. Data source. The study used the Web of Science Core Collection (WoS) [18] and Scopus databases. The selected databases cover most of the key international journals. Since the data used in this study were obtained from public databases and involved no direct interaction with human or animal subjects, ethical approval was not necessary.

2.3. Search strategy. The study used keywords: “Ebola”, “Ebola Virus Disease”, “Ebolas”, and “ebolavirus”, to retrieve EVD documents from WoS and Scopus published within 2010-2020 (6th June). The keywords were searched in the article titles to maximise the accuracy of the retrieved research output. In order to include all published documents, the basic search method was used. From both databases, only English articles of categories “Original articles” and “Editorial material” were considered for analysis in this study.

2.4. Bibliometric Analysis. This study mainly reported descriptive statistics. The research trends and selected publication
features from both databases were separately classified and analysed using "Biblioshiny app"—(using R-studio cloud) [19]—after which they were compared. These included the distribution of the most productive countries/territories, institutions, authors, research fields, journals, keywords, as well as h-index, impact factor, and total citations. In this regard, the journal impact factors were obtained from the "Journal Citation Reports (JCR)© Ranking: 2019" [20]. In addition, Microsoft Excel and VOSviewer (Van Eck & Waltman, Leiden University, The Netherlands) were used for data mining, mapping, and visualisation of the network analyses [21].

3. Results

Using the search strategy in both WoS and Scopus: TITLE: (ebola) OR TITLE: (ebola virus disease) OR TITLE: (ebolas) OR TITLE: (ebolavirus), 6073 and 6419 documents were identified from WoS and Scopus, respectively (2010-2020). Of these, 96.9% (WoS) and 94.7% (Scopus) were English documents. After refining to only English language, articles, and editorial materials, 3865 and 3848 documents from WoS and Scopus, respectively, were included in the analysis, as shown in Figure 1.

3.1. Trends in Publication and Citation. Of the total publications from WoS, 3007 (77.8%) were research articles and 858 (22.2%) were editorial material, while from Scopus, 3562 (92.6%) were articles and 286 (7.4%) were editorial material.

From 2010 to 2013, EVD publications from both databases were almost constant, with each less than 100 papers per year. However, the publications rapidly increased in 2014, attaining a maximum peak of over 800 publications from each database in 2015, after which they gradually reduced over the recent years (Figure 2(a)). The annual citation gradually decreased in both databases over the recent years, as shown in Figure 2(b). It should be noted that old documents tend to be cited more than newly
published papers; hence, the observed decreasing trend in the citation score.

3.2. Most Contributing Countries and Their Collaborations. Authors’ affiliations were analysed, which helped to identify the top prolific countries and institutions. Among the top 15 countries that contributed to EVD research output within the study period, the USA and the United Kingdom occupied the first two positions in both databases. In WoS, the USA and UK contributed to 1736 (44.9%) and 352 (9.1%), respectively, while in Scopus, they contributed 702 (18.3%) and 130 (3.4%) papers, respectively. Among the African countries, Nigeria was the top contributor with 52 (1.3%) papers in WoS and 17 (0.4) in Scopus.

Regarding single country papers (SCP), WoS had 488 (12.6%) SCP while Scopus had 758 (19.7%) SCP. The USA and UK still topped the list from both databases, as shown in Table 1.

From both databases, the most crucial countries that showed collaborations with other countries in EVD research were the USA and UK. In WoS, the USA had 36 links \( (L) \), 1621 link strength \( (LS) \) and the UK had \( L = 34 \) and \( LS = 935 \), while in Scopus, the USA had \( L = 38 \) and \( LS = 1507 \) and UK had \( L = 35 \) and \( LS = 877 \). These were followed by Germany, Sierra Leone, Guinea, France, and South Africa, among others, as shown in Figure 3.

3.3. Most Productive Institutions and Their Collaborations. The most influential institutions from WoS were the Centre for Disease Control and Prevention, CDC-USA (296, 7.7%), University of Texas Medical Branch (205, 5.3%), and University of Manitoba (164, 4.2%). From Scopus, National Institute of Allergy Infectious Diseases-NIAID (262, 6.8%), CDC-USA (169, 4.4%), and World Health Organisation-WHO (146, 3.8%) topped the list (Figure 4).

Figure 3: Network visualisation of collaborations among countries of EVD research indexed in WoS (a) and Scopus (b).
Analysis of institutional collaboration revealed that NIAID (links, $L = 39$ and link strength, $LS = 301$), WHO ($L = 36$, $LS = 239$), and CDC-USA ($L = 35$, $LS = 212$) were the top three collaborative institutions of EVD research in WoS. While in Scopus, WHO ($L = 42$, $LS = 83$), Ministry of Health & Sanitation ($L = 33$, $LS = 47$), and CDC-USA ($L = 29$, $LS = 61$), among others were the most collaborative institutions as visualised in Figure 5.

3.4. Most Influential Funding Agencies and Research Fields. The results show that from both databases, US agencies were the dominant funders of EVD studies, and these included the United States Department of Health Human Services, National Institutes of Health USA, and National Institute of Allergy Infectious Diseases-NIAID, which all funded over 200 studies in both databases (Table 2).

The top ten crucial fields in EVD research were categorised according to the WoS and Scopus fields and included "Infectious Diseases" (21.6%), "Public Environmental Occupational Health" (15.9%), and "Immunology" (13.7%), among others for WoS documents. On the other hand, "Medicine" (60.4%), "Immunology and Microbiology" (19.4%), and "Biochemistry, Genetics and Molecular Biology" (16.9%), among others, were the most crucial research fields within the Scopus documents, as shown in Figure 6.

3.5. Most Contributing Authors and Their Collaborations. The analysed publications from WoS were produced by 15093 authors, of which 488 were authors of “single-authored documents,” while Scopus documents were from 15428 authors, of which 527 were authors of “single-authored documents.” The top three productive authors of EVD research within the study period included Feldmann H, Qiu XG, and Becker S, each with over 50 papers and gained over 2000 total citations in both databases, as shown Table 3.

The collaboration index (CI) of documents from WoS was 4.55, with an average of 3.92 authors per document while 4.82 CI for Scopus documents, with an average of 4.01 authors per document.

The most crucial collaborations among authors of EVD research in the retrieved WoS literature were that of Feldmann Heinz (links ($L$) = 20, link strength ($LS$) = 139), Geisbert TW ($L = 18$, $LS = 74$), and Marzi Andrea ($L = 10$, $LS = 79$), among others. For Scopus documents, Feldmann H ($L = 23$, $LS = 147$), Qui XG ($L = 17$, $LS = 118$), and Basler CF ($L = 14$, $LS = 68$), among others were the most collaborating authors (Figure 7).

3.6. Most Productive Journals. From WoS, the analysed documents were published by 943 journals while those from Scopus were produced by 1143 journals. The ten most productive journals from both databases are listed below, where *Journal of Infectious Diseases* and *Journal of Virology* topped the lists of both databases (Table 4).

3.7. Most Cited Documents. The analysed documents from WoS had a mean citation of 16.13 per document, while those from Scopus had 16.33 citations per document. The most cited article in both databases belongs to Aylward et al. and was published in The New England Journal of Medicine in 2014, under the title “Ebola Virus Disease in West Africa—the First 9 Months of the Epidemic and Forward Projections”, with 830 and 940 total citations (TC) in WoS and Scopus, respectively. This was followed by a brief report of Baize et al. and other research articles, as shown in Table 5.

3.8. Keyword Analysis. On analysis, WoS documents had 3857 keywords plus and 4369 author keywords, while Scopus documents had 11553 keywords plus and 4387 author keywords. Keyword distribution was analysed to detect directions and topics in EVD research and to understand discipline development. The most frequent author keywords were “Ebola,” “Ebola virus,” and “Ebola virus disease” with over 200 occurrences in both databases, as shown in Figure 8. Besides, the most frequent keywords plus included “infection”, “Ebola”, and “outbreak”, as visualised in Figure 9. The size and centrality of the word reflect its frequency and magnitude. Note that keywords plus are words that frequently appear in the titles of article’s references, but do not appear in the title of the article itself, and are vital in exploring the knowledge structure of scientific fields.

Trends of topics basing on the frequency of keywords plus indicated that, in 2018, topics with keywords such as “double-blind”, “efficacy”, and “immunogenicity” dominated
in WoS, followed by topics with “ring vaccination”, “candidate”, and “adults” in 2019. For Scopus documents, topics with keywords like “DRC”, “drug effect”, and “cohort analysis” dominated in 2018, followed by topics of “veterinary medicine”, “whole genome sequencing”, and “coronavirus infection”, among others in 2019-2020, as shown in Supplementary file 1.

4. Discussion

This bibliometric analysis presented an updated insight in the trend and scientific output of EVD-related publications. The initial search revealed that over 90% of the publications from both databases were in English, implying that English is the broadest language used in most official and international communications. Besides, research articles and editorial material were included in this study because, in times of disease outbreaks and emergencies, the first findings or scientific communications are usually published in the form of editorials. Nevertheless, these two types of documents contributed to over 60% of the EVD publications in both databases, which directly translates into the efforts rendered towards EVD research during the study period.

Trends in EVD publication output showed a rapid increase from 2014 with a peak in 2015. This was a period of the 2014-2016 Ebola outbreak in West Africa, the largest outbreak in EVD history that spread to several countries in West Africa, claiming several thousands of lives [22]. The analysis also identified a significant publication output from both databases between 2018 and 2020, which is as a result
of the recent 2018-2020 Kivu EVD outbreak in the DRC [6]. The research output is expected to increase throughout 2020 owing to the 11th EVD outbreak declared on 1st June 2020 [23], and the newly, plus the yet to be, approved Ebola vaccines [24].

Among the top countries contributing to EVD research, the USA and the UK, among other Western countries, dominated the lists in both databases. Only, Nigeria and South Africa appeared in the top ten productive countries. The results align with Yi et al. [25] and Pouris and Ho [26],

Table 2: Top 10 funding agencies of EVD research (2010-2020).

| Rank | Funding agencies (WoS) | No. of papers (%), N = 3865 | Funding agencies (Scopus) | No. of papers (%), N = 3848 |
|------|------------------------|-----------------------------|---------------------------|-----------------------------|
| 1st  | US Dept. of Health Human Services | 742 (19.2) | National Institutes of Health USA | 422 (10.9) |
| 2nd  | National Institutes of Health USA | 691 (17.9) | NIAID | 205 (5.3) |
| 3rd  | NIAID | 303 (7.8) | Defense Threat Reduction Agency | 90 (2.3) |
| 4th  | US Depart. of Defense | 160 (4.1) | National Science Foundation NSF | 82 (2.1) |
| 5th  | Defense Threat Reduction Agency | 124 (3.2) | National Natural Science Foundation of China | 78 (2.0) |
| 6th  | Wellcome Trust | 106 (2.7) | Centers for Disease Control and Prevention | 59 (1.5) |
| 7th  | National Natural Science Foundation of China | 100 (2.6) | Wellcome Trust | 54 (1.4) |
| 8th  | World Health Organization | 97 (2.5) | Deutsche Forschungsgemeinschaft | 45 (1.2) |
| 9th  | National Science Foundation NSF | 95 (2.5) | World Health Organization | 45 (1.2) |
| 10th | European Union EU | 84 (2.2) | National Institute of General Medical Sciences | 44 (1.1) |

Table 3: Top 10 productive authors of EVD research (2010-2020).

| Rank | Author | h-index | WoS Total citations | No. of papers | Scopus Total citations | No. of papers |
|------|--------|---------|---------------------|--------------|-----------------------|--------------|
| 1st  | Feldmann H | 35 | 3851 | 96 | Feldmann H | 33 | 3147 | 80 |
| 2nd  | Qiu XG | 26 | 2396 | 66 | Qiu X | 26 | 2564 | 63 |
| 3rd  | Becker S | 22 | 2211 | 53 | Becker S | 23 | 2331 | 51 |
| 4th  | Bavari S | 22 | 1312 | 52 | Bavari S | 21 | 1361 | 49 |
| 5th  | Nichol ST | 28 | 2375 | 51 | Nichol ST | 26 | 2462 | 49 |
| 6th  | Geisbert TW | 24 | 2736 | 50 | Dye JM | 24 | 1997 | 44 |
| 7th  | Kobinger GP | 25 | 2232 | 49 | Basler CF | 25 | 1711 | 42 |
| 8th  | Marzi A | 23 | 1517 | 48 | Marzi A | 23 | 1458 | 42 |
| 9th  | Saphire EO | 21 | 1386 | 48 | Kobinger GP | 25 | 2409 | 41 |
| 10th | Dye JM | 24 | 1916 | 46 | Wong G | 19 | 1848 | 40 |

Figure 6: Most crucial research fields of EVD studies (2010-2020) in WoS and Scopus.
implying that the USA has maintained its leading role in not only EVD research but also other research fields. Besides, the top influential institutions included NIAID, CDC-USA, and WHO, among others, with only one African institution on the list of the top ten. Given the fact that EVD is endemic and mostly affects African countries [27], the dominancy of Western countries and institutions in EVD research implies a need for more focus and involvement of African countries in EVD research.

Network analysis showed that the WHO, CDC, and NIAID exhibited the highest degree of collaboration within EVD research. Such institutions operate within various

Figure 7: Coauthorship analysis of the most influential authors of EVD research (2010-2020) from WoS (a) and Scopus (b).
countries, especially in Africa, where they support the Ministries of Health, thus explaining their dominant institutional partnerships. Besides, the analysis showed the most evident country collaborations to be that of the USA, UK, and France. Several African countries also exhibited a significant degree of cooperation. In one perspective, this may demonstrate the Public Health Diplomacy (PHD) exhibited by the international community and the role of partnerships in managing disease outbreaks and global emergencies. However, since African countries mainly contributed in the form of collaborations (with less single-country papers), it implies a need for African

| Rank  | Journal name | WoS No. of papers (%) | Impact factor (2019) | Journal name | Scopus No. of papers (%) | Impact factor (2019) |
|-------|--------------|-----------------------|----------------------|--------------|--------------------------|---------------------|
| 1st   | Journal of Infectious Diseases | 223 (5.8) | 4.73 | Journal of Infectious Diseases | 146 (3.8) | 4.73 |
| 2nd   | Journal of Virology | 107 (2.8) | 4.16 | Journal of Virology | 107 (2.8) | 4.16 |
| 3rd   | Lancet | 105 (2.7) | 43.38 | PLoS One | 100 (2.6) | 2.87 |
| 4th   | PLoS One | 101 (2.6) | 2.87 | PLoS Neglected Tropical Diseases | 91 (2.4) | 4.40 |
| 5th   | Emerging Infectious Diseases | 86 (2.2) | 6.81 | Emerging Infectious Diseases | 82 (2.1) | 6.81 |
| 6th   | Morbidity and Mortality Weekly Report | 85 (2.2) | 14.40 | Scientific Reports | 72 (1.9) | 4.12 |
| 7th   | PLoS Neglected Tropical Diseases | 83 (2.1) | 4.40 | New England Journal of Medicine | 52 (1.4) | 37.91 |
| 8th   | Lancet Infectious Diseases | 82 (2.1) | 21.77 | Morbidity and Mortality Weekly Report | 51 (1.3) | 14.40 |
| 9th   | Scientific Reports | 72 (1.9) | 4.12 | Viruses | 49 (1.3) | 3.76 |
| 10th  | New England Journal of Medicine | 60 (1.5) | 37.91 | Antiviral Research | 42 (1.1) | 4.13 |

Table 4: Top 10 journals of EVD research.

| Authors, year | Document title and journal name | Document type | TC (WoS) | TC (Scopus) |
|---------------|--------------------------------|---------------|----------|------------|
| Aylward et al. 2014 | Ebola virus disease in West Africa-the first 9 months of the epidemic and forward projections, The New England Journal of Medicine | Research article | 830 | 940 |
| Baise et al. 2014 | Emergence of Zaire Ebola virus disease in Guinea, New England Journal of Medicine | Brief report | 753 | 871 |
| Feldmann Geisbert 2011 | Ebola haemorrhagic fever, The Lancet | Research article | 700 | -N/A- |
| Gire et al. 2014 | Genomic surveillance elucidates Ebola virus origin and transmission during the 2014 outbreak, Science | Research article | 635 | 685 |
| Carette et al. 2011 | Ebola virus entry requires the cholesterol transporter Niemann–Pick C1, Nature | Research article | 630 | 662 |
| Qiu et al. 2014 | Reversion of advanced Ebola virus disease in nonhuman primates with ZMapp, Nature | Research article | 557 | 613 |
| Henao-Restrepo et al. 2015 | Efficacy and effectiveness of an rVSV-vectored vaccine expressing Ebola surface glycoprotein: interim results from the Guinea ring vaccination cluster-randomised trial, The Lancet | Research article | 441 | 473 |
| Quick et al. 2016 | Real-time, portable genome sequencing for Ebola surveillance, Nature | Research article | 430 | 459 |
| Côté et al. 2011 | Small molecule inhibitors reveal Niemann–Pick C1 is essential for Ebola virus infection, Nature | Research article | 379 | 399 |
| Schieffelin et al. 2014 | Clinical illness and outcomes in patients with Ebola in Sierra Leone, New England Journal of Medicine. | Research article | 332 | 366 |

Table 5: The top 10 most cited EVD documents in WoS and Scopus (2010-2020).
countries to develop and improve their research facilities to enable them to carry out independent research.

With regard to funding EVD research, mostly the US and Western agencies topped the list, with no African agency among the top ten. This implies a need for more funding of EVD research from African governments and institutions. The most key EVD research fields were “Infectious Diseases” and “Medicine,” among others. This could imply the top fields that attract funds within EVD research, as well as the key funding institutions of such fields.

Besides, the analysis noted that the top journals of EVD research are foreign journals, which included *Journal of Infectious Diseases* and *Journal of Virology*, among others. This implies that most of the valuable EVD research findings and recommendations are published in foreign journals, whose accessibility by the African community is questionable. These recommendations may just remain on papers unutilised if they are not freely or easily accessible. Therefore, there is a need for African countries to improve and strengthen local research databases and journals for easier dissemination of EVD research findings.

The study results identified the most contributing authors of EVD research, which included Feldmann H, Qiu XG, and Becker S, among others. Furthermore, network analysis revealed authors with the highest collaborations. This information would be helpful to future researchers in this field, to quickly identify the crucial possible researchers for partnership or even consultation.

The most highly cited article was written by Aylward et al. in 2014; this was the first document to give a general insight into the 2014-2016 EVD outbreak, which had already spread to five countries by then. The paper tried to account for the first 9 months of the epidemic and predicted a rise in the number of cases from hundreds to thousands if no effective control measures implemented [22].

Keyword analysis revealed the most common keywords, which included “hemorrhagic-fever” and “Ebola”, among others. The dominancy of topics with keywords like “double-blind”, “efficacy”, “immunogenicity”, “ring vaccination”, and “DRC”, among others in 2018 reflects the efforts put in formulating and testing new effective Ebola vaccines in the Kivu outbreak [28].
Besides, the dominance of topics of “veterinary medicine” and “coronavirus infection” suggests a link between EVD and COVID-19, as both are zoonotic diseases which can be transmitted by bats to the human population and have similar prevention and control measures [4, 29].

Unlike other previous similar bibliometric studies, this one concurrently analysed and compared two databases (WoS and Scopus). However, this study also had some limitations, like the analysis underestimated publications in other languages, although few, they could be of value in this field.

5. Conclusions

The current bibliometric analysis summarised EVD research output (2010-2020), in which it highlighted an enormous publication output during the study period. The study has identified the leading roles played by various stakeholders in addressing EVD, in which it noted the top productive countries, authors, institutions, and journals. However, the contribution of African countries is not sufficiently reflected, thus implying a need for more focus, involvement, and funding of EVD research for effective prevention and control of EVD. Besides, the study noted a significant degree of collaboration among various stakeholders. This is vital, as it enables knowledge sharing and transfer also required for effective prevention and control, as well as vaccine development.

Data Availability

All research data used to support the findings of this study are included within the article, and the analysed data used can be freely accessed from the Web of Science data collection and Scopus.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Authors’ Contributions

J.K and X.Y helped in the conceptualisation. X.J,Y helped in the methodology., T.H.M and J.K helped in the software, visualisation, and formal analyses., J.K helped in the writing and original draft preparation., X.J,Y and T.H.M helped in the writing and review and editing. X.Y helped in the supervision and funding acquisition.

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Supplementary Materials

(a) Showing the trend of topics based on keywords plus from Web of Science (2010-2020) and (b) showing the trend of topics based on keywords plus from Scopus (2010-2020). (Supplementary Materials)

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