



A bibliometric analysis on the influence of social media during the COVID-19 pandemic

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ABSTRACT

There is limited literature that discusses the trends of social media during the COVID-19 pandemic. This bibliometric analysis aims to evaluate the global research growth on “social media and COVID-19” by analysing related publications in the Scopus database. The objectives are to examine the research trends related to social media and COVID-19 as well as details of co-authorship, leading institutions and countries, top scholars, and leading author keywords. The study used the VOS Viewer 1.6.11 software to analyse the collected bibliographic data and visualise the global research trends using bibliometric maps. A total of 1,994 journal articles from the Scopus database published in 2020–2021 was analysed. The leading countries in social media and COVID-19 research are United States and United Kingdom. Among the 15 leading universities, four can be found in the world's top-40 university ranking. Among the social media platforms, Twitter was found to have the most linkages with social media, which suggests that Twitter is the most frequently used platform to disseminate pandemic information. Based on the author keywords analysis, “older adults” and “health policy” are potential areas of concern that future research could fruitfully explore. This paper has significant implications for healthcare academicians, organisations, and policymakers in understanding the global trends of “social media and COVID-19”.

Keywords: **Bibliometric analysis, bibliographic map, VOS Viewer, social media, COVID-19**

INTRODUCTION

Social media has increasingly become a common platform for ordinary people to access information and to voice their opinions (Tanha, 2020). Needless to say, it has played and continues to play a major role in the ongoing COVID-19 pandemic. For instance, health authorities utilise social media extensively to promote effective approaches and necessary procedures to the public to stay safe (Hussain, 2020). It is common belief that important information can be conveyed rapidly to the public through social media, so that the public can be aware of safety measures (Hussain, 2020). Although social media is helpful in delivering information via different platforms, the spread of information should be carefully done to avoid misinformation which could lead to negative consequences (Cinelli et al., 2020).

In addition to misinformation, in the early stages of the pandemic, residents of the affected regions faced a barrage of negative emotions due to the overload of information on social media, causing anxiety, depression, panic attack, and other mental illnesses (Freiling, Krause, Scheufele, & Brossard, 2021). The deluge of misinformation or commonly referred to as “infodemic” caused mental health issues among netizens as they struggled to differentiate fake news from the truth on social media platforms (Naeem & Bhatti, 2020), to the extent of causing panic attack in some (Ahmad & Murad, 2020). However, fake news on social media is inevitable as gatekeepers such as the Ministry of Communication and Multimedia do not have the necessary resources nor time to check and verify each piece of online news or post (Talwar, Dhir, Kaur, Zafar, & Alrasheedy, 2019).

Apart from social impacts, social media can also affect the decision-making process of policy makers and related authorities. Kaya, Sağsan, Medeni, Medeni, and Yıldız (2020) contended that decision makers could be affected by the social media posts even as they utilise social media to provide updates and disseminate information on COVID-19 (Abd-Alrazaq, Alhuwail, Househ, Hamdi, & Shah, 2020). According to Gokalp, Karkın, and Calhan (2020), in recognising the significant influence of social media in disseminating information, policy makers and authorities have been swiftly moving away from traditional communication methods to social media platforms.

Past studies on the trends of social media have been conducted in various contexts, for example, social media in psychology (Sa’ed, Sweileh, Awang, & Al-Jabi, 2018), social media as a knowledge management platform (Noor, Guo, Shah, Nawaz, & Butt, 2020), social media in tourism (Nusair, Butt, & Nikhashemi, 2019), social media in education (Hashim, Rashid, & Atalla, 2018), amongst others. While these past studies looked at how social media can influence users in their respective fields, the global trend regarding the role of social media in the context of a pandemic (particularly COVID-19) has yet to be studied.

Scopus, known as the largest database of indexed multidisciplinary research, was selected as the main data mining source for this study. The bibliometric analysis is expected to help policymakers, stakeholders, and academicians, particularly in the healthcare sector to understand better the trends of social media in a pandemic as well as suggest new research directions. In summary, this paper has four objectives: (a) to examine the overall trends of research work related to social media and COVID-19; (b) to specify the contributions of productive scholars, institutions, and countries; (c) to explore the terminology, topics of interest, and concept of social media in COVID-19; and (d) to deliver new insights for future research directions.

METHOD

Bibliometric analysis is an approach that applies statistics and mathematics to written communication for the purpose of comprehending the development of a particular field or context (Pritchard, 1969). It is also conceptualised as a method used to discover the growth, trend, and importance of a particular discipline in the academic field (Shah, Lei, Ali, Doronin, & Hussain, 2019). The conventional concept of bibliometric analysis used to focus on content analysis and citation (Zupic & Cater, 2015); however, the newer improved version, includes author keywords, country analysis, institution analysis, and author analysis (Noor et al., 2020).

It should be noted however, that bibliometric analysis differs from a review paper as it also elucidates the performance of publications in a particular field, by examining the research growth, most productive and highly cited authors, top journals, and highly influential papers (Cobo, López-Herrera, Herrera-Viedma, & Herrera, 2011). In this regard, the present study examines the recent trends in literature concerning social media and COVID-19 using a bibliometric analysis.

Firstly, the authors collected bibliometric data such as author, title, abstract, country, citation record, author affiliation etc from the most widely referred repository, which is Scopus. In addition, we also retrieved several performance indicators for the bibliometric analysis such as: Total Papers (TP), which is the total number of publications from the source, Total Citations (TC), which is the total number of citations received by the publication, and Total Publications per Country (TPC), which is the total number of publications from the top leading countries.

Search Procedure

A data mining exercise was performed on April 29, 2021 via Scopus, focusing on the main theme of “Social Media and COVID-19”. These keywords were searched in titles and abstracts to investigate the global research trend on the role of social media during the COVID-19 pandemic.

All the extracted journal papers were then organised by year, from the first articles published in 2020 to the newest articles published in 2021. The query string setting was as follows: TITLE-ABS-KEY (“Social media”) AND TITLE-ABS-KEY (covid-19) OR TITLE-ABS-KEY (coronavirus) OR TITLE-ABS-KEY (covid) AND (LIMIT-TO (SRCTYPE, "j")) AND (LIMIT-TO (PUBSTAGE, "final")) AND (LIMIT-TO (PUBYEAR, 2021) OR LIMIT-TO (PUBYEAR, 2020)) AND (LIMIT-TO (LANGUAGE, "English")). As a result, a total of 3,084 documents was discovered using this query string.

The 3,084 documents also included non-empirical papers such as conference papers, review papers, note, letter, and erratum. However, these types of documents were irrelevant to be included in the bibliometric analysis. Hence, the authors took the next step of excluding all non-empirical papers. This step was carried out by including phrases such as “review” and “progress” into the query string. Through this data screening step, the authors found 1,087 non-empirical papers. Thus, by removing the non-empirical papers, the authors managed to narrow down the final selection to 1,994 documents.

The 1,994 documents were then examined based on year, author(s), country, affiliation, subject area, and source. The authors also gathered several bibliometric indicators such as h-index and total citations to construct a ranking list. Figure 1 illustrates the procedure of the search. Further details of the query strings are listed in Table 1.

Table 1. Search procedure and query strings

Items	Theme	Search for	Query String	Number of publications
1	Central	Social Media and COVID-19	(TITLE-ABS-KEY ("Social media") AND TITLE-ABS-KEY (covid-19) OR TITLE-ABS-KEY (coronavirus) OR TITLE-ABS-KEY (covid)) AND (LIMIT-TO (SRCTYPE, "j")) AND (LIMIT-TO (PUBSTAGE, "final")) AND (LIMIT-TO (PUBYEAR, 2021) OR LIMIT-TO (PUBYEAR, 2020)) AND (LIMIT-TO (LANGUAGE, "English"))	3, 084
2	Central	Social Media and COVID-19 (Article only)	(TITLE-ABS-KEY ("Social media") AND TITLE-ABS-KEY (covid-19) OR TITLE-ABS-KEY (coronavirus) OR TITLE-ABS-KEY (covid)) AND (LIMIT-TO (SRCTYPE, "j")) AND (LIMIT-TO (PUBSTAGE, "final")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (PUBYEAR, 2021) OR LIMIT-TO (PUBYEAR, 2020)) AND (LIMIT-TO (LANGUAGE, "English"))	1, 994

Bibliometric Map

For the next stage of the data analysis, the authors exported the bibliographical information of 1,994 articles to VOSviewer version 1.6.11. VOSviewer is an effective tool used by the authors to visualise the bibliometric map as presented in the following sections. VOSviewer was able to present the leading countries and frequency of author keywords in the context of social media and COVID-19. Further discussion of the bibliometric map can be found in the following sections.

Co-authorship Analysis

The findings from the co-authorship analysis suggest that 124 countries were associated with 159 authors. The authors ensured that the names of countries were not accidentally repeated in different abbreviations, hence a thesaurus file was created. In the thesaurus file, similar country names were grouped together, for example, "US" and "United States" were grouped as "United States". The associated nations were grouped into nine regions: United States, United Kingdom, Middle East, Asia, Oceania, Europe, Eurasia, Africa, and Caribbean.

Analysis of Co-occurrence

The keyword co-occurrence analysis found 182 author keywords from 1,994 research papers. Prior to the author keyword analysis in VOSviewer, the authors created a thesaurus file to identify any repeating keywords. To do that, the authors screened each of the author keywords and grouped similar keywords together. For example, coronavirus and covid has the same meaning with COVID-19, hence they were re-labelled as "COVID-19". The authors also set a minimum of five keywords occurrences to produce the output of analysis.

ANALYSIS RESULTS

Research Growth

Social media has been gaining rapid scholarly attention since the COVID-19 pandemic began in 2020. This is evident from the 1,994 research papers on this topic published in the

span of less than two years. Figure 1 illustrates the growth of publications on this topic in Scopus. The number of publications on social media and COVID-19 in 2020 was 1,237 journal articles while the first four months of 2021 recorded 757 papers. We believe that the research efforts on this topic will continue to grow as the pandemic remains incessant.

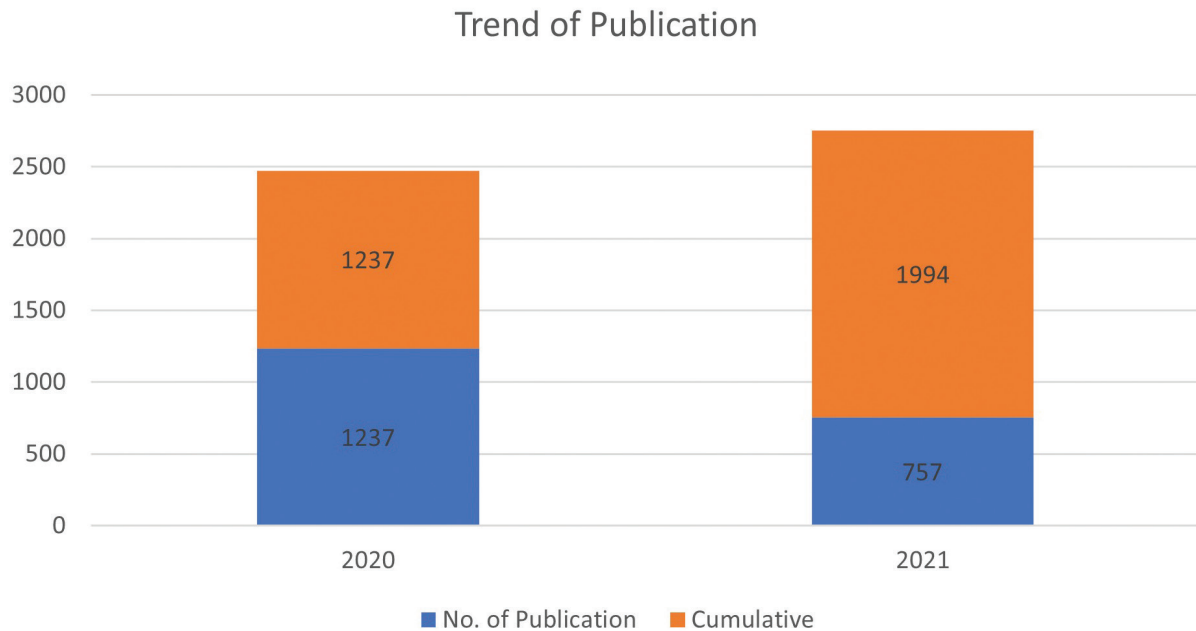


Figure 1. Number of social media and COVID-19 articles in the Scopus database (2020–2021)

Based on the subject area analysis, we can see that this topic has drawn the interest of both the natural science and social science fields. This is evidenced by the top ten subject areas in Scopus which featured articles of the topic: Medicine (1,153 articles), Social Sciences (462 articles), Computer Science (179), Environmental Science (163), Biochemistry, Genetics and Molecular Biology (145 articles) Psychology (133 articles), Arts and Humanities (109 articles), Multidisciplinary (96), Nursing (96), as well as Agricultural and Biological (92). While Business, Management and Accounting comes in at 12th position with 81 journal articles.

These findings indicate that apart from publications in the conventional fields, there is a wider coverage of social media and COVID-19 in various other disciplines as well, which demonstrates the broader integration of interdisciplinary works from various disciplines.

Top Productive Journals

Table 2 presents all the results concerning the total publications and total citations of the leading journals that published on this topic. The leading journals are ranked according to the total number of publications. As shown in Table 2, the top 10 leading journals are published by seven different publishers. The top three journals are published by Journal of Medical Internet Research, Multidisciplinary Digital Publishing Institute (MDPI) and Public Library of Science. Of the seven publishers, Frontiers Media S.A. published the highest number of journals, where three out of 10 journals are from this publisher. The remaining journals are published by BMJ Publishing Group, University of Idaho Library, and SAGE publications.

Most of the leading journals are in Quartile 1 (Q1) and only four journals are in Quartile 2 (Q2). *Journal of Medical Internet Research* published the greatest number of papers on social media and COVID-19 (102 or 5% of total publications), with 860 citation counts. This is followed by *International Journal of Environmental Research and Public Health* with 96 publications and highest citation count of 868. *Plos One* has the third highest citation count of 716, with 63 publications. While *BMJ Open* is ranked at 4th place with 33 publications and 56 total citations, followed by *Sustainability Switzerland* with 27 publications and 125 total citations.

Although *Frontiers in Psychiatry* is ranked at 6th place (24 papers), it has the fourth highest citation count of 240. This is followed by *Frontiers in Public Health* with 21 publications which represent 1.05% of total publications, and *Frontiers in Psychology* with 20 publications which represent 1% of total publications. At 9th place, is *Library Philosophy and Practice* with 17 publications and *Social Media and Society* at 10th place with 16 publications. Interestingly, although *Social Media and Society* is ranked last, it has the second highest CiteScore.

Table 2. Leading journals on social media and COVID-19 studies (based on total publications)

Rank	Journal	Quartile	TP (%)	TC	CiteScore (2019)	Most cited article (Reference)	Times cited	Publisher
1	<i>Journal of Medical Internet Research</i>	Q1	102 (5.11)	860	3.9	Top concerns of tweeters during the COVID-19 pandemic: A surveillance study (Abd-Alrazaq et al., 2020)	113	Journal of medical Internet Research
2	<i>International Journal of Environmental Research and Public Health</i>	Q2	96 (4.81)	868	3.0	Impact of the COVID-19 pandemic on mental health and quality of life among local residents in Liaoning Province, China: A cross-sectional study (Zhang and Ma, 2020)	255	Multidisciplinary Digital Publishing Institute (MDPI)
3	<i>Plos One</i>	Q1	63 (3.16)	716	5.2	Mental health problems and social media exposure during COVID-19 outbreak (Gao et al., 2020)	410	Public Library of Science
4	<i>BMJ Open</i>	Q1	33 (1.65)	56	3.5	Mental health in the UK during the COVID-19 pandemic: cross-sectional analyses from a community cohort study (Jia et al., 2020)	25	BMJ Publishing Group

Table 2. (con't)

Rank	Journal	Quartile	TP (%)	TC	CiteScore (2019)	Most cited article (Reference)	Times cited	Publisher
5	<i>Sustainability Switzerland</i>	Q2	27 (2.26)	125	3.2	Policy response, social media and science journalism for the sustainability of the public health system amid the COVID-19 outbreak: The Vietnam lessons (La et al., 2020)	59	Multidisciplinary Digital Publishing Institute (MDPI)
6	<i>Frontiers in Psychiatry</i>	Q1	24 (1.20)	240	3.2	Survey of insomnia and related social psychological factors among medical staff involved in the 2019 novel coronavirus disease outbreak (Zhang et al., 2020)	145	Frontiers Media S.A.
7	<i>Frontiers in Public Health Research</i>	Q2	21 (1.05)	58	2.0	Medical students and COVID-19: Knowledge, attitudes, and precautionary measures. A descriptive study from Jordan (Khasawneh et al., 2020)	33	Frontiers Media S.A.
8	<i>Frontiers in Psychology</i>	Q1	20 (1.00)	45	3.2	Inoculating against fake news about COVID-19 (van der Linden, Roozenbeek, & Compton, 2020)	13	Frontiers Media S.A.
9	<i>Library Philosophy and Practice</i>	Q2	17 (0.85)	2	0.3	Library services through social media during lockdown due to COVID-19 with special reference to University Libraries of Assam (Neog, 2020)	1	University of Idaho Library
10	<i>Social Media and Society</i>	Q1	16 (0.80)	17	5.0	Changes in digital communication during the COVID-19 global pandemic: Implications for digital inequality and future research (Nguyen et al., 2020)	6	SAGE publications

Note: TP= Total publications; TC= Total citations

With regard to CiteScore 2019, two journals has a score of more than 5.0: *Plos One* with a score of 5.2, followed by *Social Media and Society* at 5.0. The journal with the lowest CiteScore is *Frontiers in Public Health* (2.0) and *Library Philosophy and Practice* (0.3).

According to Khudzari, Kurian, Tartakovsky, and Raghavan (2018), CiteScore is an essential criterion for researchers in selecting the most suitable journals to publish in. Therefore, to assist future scholars, the authors have included a list of the leading journals and their CiteScore (Table 3).

Table 3. The leading journals in social media and COVID-19 studies

Rank	Name of journal	CiteScore in 2019	Publisher	Number of publications
1	<i>Plos One</i>	5.2	Public Library of Science	63
2	<i>Social Media and Society</i>	5.0	SAGE Publications	16
3	<i>Journal of Medical Internet Research</i>	3.9	Journal of Medical Internet Research	102
4	<i>BMJ Open</i>	3.5	BMJ Publishing Group	33
5	<i>Sustainability Switzerland</i>	3.2	Multidisciplinary Digital Publishing Institute	27
6	<i>Frontiers in Psychiatry</i>	3.2	Frontiers Media S.A.	24
7	<i>Frontiers in Psychology</i>	3.2	Frontiers Media S.A.	20
8	<i>International Journal of Environmental Research and Public Health</i>	3.0	Multidisciplinary Digital Publishing Institute	94
9	<i>Frontiers in Public Health</i>	2.0	Frontiers Media S.A.	21
10	<i>Library Philosophy and Practice</i>	0.3	University of Idaho Library	17

Source: Scopus database

Top Nations, Collaborations, and Institutions

Table 4 lists the most productive countries that contributed to the growth of social media and COVID-19 studies globally based on TPC (total publications of the country). United States tops the list with 555 publications, contributing 62% of the publications globally, and emerges as the lead country in social media and COVID-19 research. United States is followed by United Kingdom with 235 publications (49% of single-country publications), China with 205 publications (42% of single-country publications) and India with 151 publications (77% of single-country publications).

Besides the top four countries mentioned above, a total of five other countries (i.e., Australia, Italy, Canada, Spain, and Saudi Arabia), have also published between 85 and 123 papers. The remaining countries such as Brazil, Pakistan, Turkey, Germany, Indonesia, and Hong Kong are ranked at 10th to 15th placing, producing between 45 and 58 total publications.

Table 4. Leading nations and institutes in social media and COVID-19 studies

Rank	Country	TPC	SCP (%)	Leading academic institution	TPI
1	United States	555	62.34	Harvard Medical School, Harvard University	20
2	United Kingdom	235	40.85	King's College London	19

Table 4. (con't)

Rank	Country	TPC	SCP (%)	Leading academic institution	TPI
3	China	205	41.95	Wuhan University	20
4	India	151	76.82	Saveetha Institute of Medical and Technical Sciences	11
5	Australia	123	41.46	University of Melbourne	20
6	Italy	107	50.47	Sapienza Università di Roma	12
7	Canada	101	34.65	University of Toronto	26
8	Spain	86	0	University of Valencia	9
9	Saudi Arabia	85	0	Umm Al Qura University	13
10	Brazil	58	0	Universidade de Sao Paulo - USP	8
11	Pakistan	52	48.07	University of the Punjab, Lahore	7
12	Turkey	52	69.23	Ondokuz Mayıs Üniversitesi	6
13	Germany	51	35.29	Charité – Universitätsmedizin Berlin	5
14	Indonesia	50	68.00	Universitas Indonesia	12
15	Hong Kong	45	15.55	Hong Kong Polytechnic University	15

Note: TPC: total publications of the country; SCP: single-country publications; TPI: total publications of institute

Table 4 also shows that only five countries contributed more than 50% of single-country publications (SCP): India (77%), Turkey (69%), Indonesia (68%), United States (62%) and lastly, Italy (50%). According to Khudzari et al. (2018), a high percentage of SCP is an indication that the nations had more collaborations among them. International collaborations are important as it is an essential strategy for knowledge sharing and to get higher ranking in publications.

In reference to the World University Rankings 2019, of the leading academic institutions listed in Table 4, five are listed in the top 150 best universities of the world (Times Higher Education [THE], 2020). A total of four universities are ranked among the top 40 best world universities: Harvard University (7th), University of Toronto (28th), University of Melbourne (32nd), King's College London (33rd), while Hong Kong Polytechnic University is ranked as the 106th best university in the world. This result suggests that social media and COVID-19 has been gaining the interest and acknowledgement of top global education and research institutions. The top 30 leading nations and institutions in social media and COVID-19 studies are presented in Table 5.

Table 5. The top 30 leading institutions in social media and COVID-19 studies

Rank	Institution	Country	No. of Publications
1	University of Toronto	Canada	25
2	Harvard Medical School	United States	21
3	University of Melbourne	Australia	20
4	Wuhan University	China	20
5	The University of Jordan	Jordan	20

Table 5. (con't)

Rank	Institution	Country	No. of Publications
6	University College London	United Kingdom	19
7	King's College London	United Kingdom	18
8	University of Pennsylvania	United States	16
9	Hong Kong Polytechnic University	Hong Kong	16
10	University of Oxford	United Kingdom	16
11	Jordan University of Science and Technology	Jordan	16
12	Harvard University	United States	15
13	Monash University	Malaysia	15
14	University of California, San Francisco	United States	15
15	Huazhong University of Science and Technology	China	15
16	The University of Hong Kong	Hong Kong	14
17	The University of North Carolina at Chapel Hill	United States	14
18	Columbia University	United States	14
19	Universiti Sains Malaysia	Malaysia	13
20	Umm Al Qura University	Saudi Arabia	13
21	Johns Hopkins University	United States	12
22	Chinese Academy of Sciences	China	12
23	University of Macau	China	12
24	The University of Sydney	Australia	12
25	University of Michigan, Ann Arbor	United States	12
26	University of California, San Diego	United States	12
27	London School of Hygiene & Tropical Medicine	United Kingdom	12
28	Sapienza Università di Roma	Italy	12
29	Universitas Indonesia	Indonesia	12
30	Tongji Medical College	China	11

Source: Scopus database

Using VOSviewer, which is the most widely used information visualisation software, the authors present a visualisation of the linkages between the nations that are leading the research on social media and COVID-19 (Figure 2). As shown in Figure 2, the thicker the connecting lines and the nearer the positions, the stronger the linkage between the nations. In regard to social media and COVID-19 studies, US is the leading country with the highest publication rate, followed by UK.

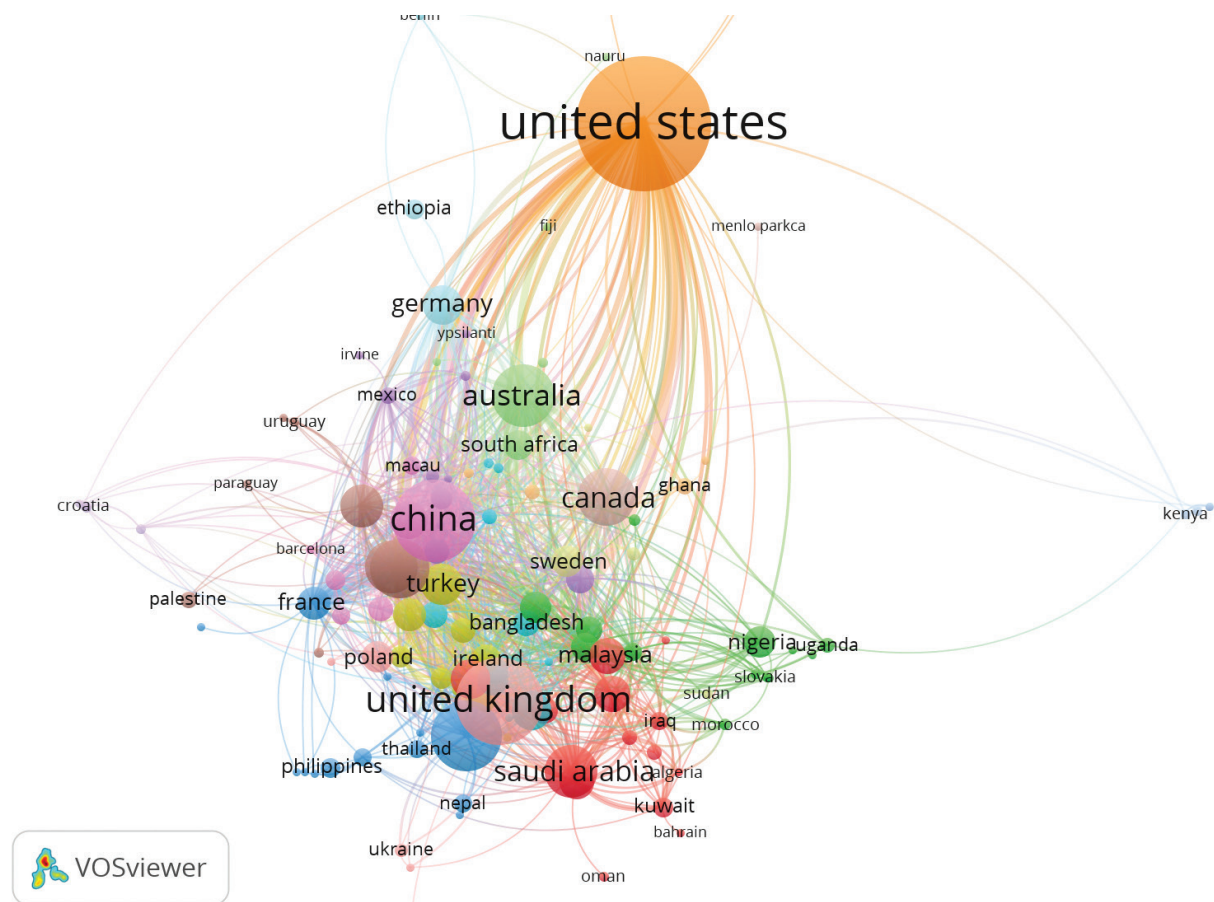


Figure 2. The bibliometric map of co-authorships

The analysis on co-authorship shows that US is also the country with the highest number of affiliations (102 links, 475 co-authorship), followed by UK (78 links, 367 co-authorship), Italy (61 links, 196 co-authorship), Spain (59 links, 180 co-authorship), and others. The analysis also reveals that only 34% of the nations had more than 20 international collaborative publications. In addition to that, a total of seven nations were not affiliated with any other countries in publishing social media and COVID-19 papers, for example, Botswana, Sri Lanka, Jamaica, and others. It is suggested that these nations should foster more international collaborations by increasing the number of international students in their universities, promoting a diverse working culture, improving research funding, and encouraging an international collaborative research climate at public and private institutions.

Most Productive and Highly Cited Authors

The top 15 leading authors on social media and COVID-19 are ranked based on the number of publications (Table 6). These authors are associated with seven nations including United States (5), Jordan (3), Canada (2), China (2), United Kingdom (1), Finland (1), and Taiwan (1) in which five were first authors, one second author, while the remaining were third author or above.

Zhu, T. is the highest contributor in the Scopus database with a total of nine publications (TC=56) and a h-index of 5, while Xue, J. is the second highest contributor with seven publications (TC=51) and a h-index of 5. The next three most productive authors (Basch, C.H., Griffiths, M.D., and Hall, B.J.) from US, UK, and China, respectively,

published a total of five publications. Basch is the second most highly cited author with 67 citations, while Griffiths and Hall received 41 and 47 citations, respectively.

The authors ranked at 6th, 7th, and 8th place are all first authors, in which Laato, S. (ranked 6th, from Finland) received the highest number of total citations (TC=121) as compared to the other top 15 productive authors. Ababneh, N.A. (ranked 9th) and Al-Haidar, A. (ranked 10th), both from Jordan, had a combined record of four publications, 38 total citations and h-index of 3.

The most productive author ranked at 11th place is Ali, S.H, who is from the U.S., and he is a first author with four publications and a 2 h-index. The remaining authors ranked between 12th to 15th place are all third authors or above, with four publications. Among these four authors, Basch, C.E (ranked 13th) has the greatest number of citations (52), while Chen, C. (ranked 15th) has the highest h-index of 4.

It can be concluded that the aforementioned authors are the most influential authors in the domain of social media and COVID-19 based on the number of papers published in Scopus and the high citations.

Table 6. The top 15 leading scholars in social media and COVID-19 research

Rank	Author	ID of author in Scopus	First publication year*	TP	h-index	TC	Current affiliation	Country
1	Zhu, T.	35191483900	2020c	9	5	56	University of Chinese Academy of Sciences	China
2	Xue, J.	56074994800	2020b	7	5	51	University of Toronto	Canada
3	Basch, C.H.	55145830600	2020a	5	4	67	William Paterson University	United States
4	Griffiths, M.D.	7201549643	2020c	5	3	41	Nottingham Trent University	United Kingdom
5	Hall, B.J.	57218302519	2020c	5	3	47	NYU Shanghai	China
6	Laato, S.	57195940928	2020a	5	4	121	Turun yliopisto	Finland
7	Li, J.	57209587966	2020a	5	2	43	Global Health Policy Institute	United States
8	Lin, C.Y.	37124450500	2020a	5	3	41	National Cheng Kung University	Taiwan
9	Ababneh, N.A.	55407826100	2020c	4	3	38	The University of Jordan	Jordan
10	Al-Haidar, A.	57218187362	2020c	4	3	38	The University of Jordan	Jordan

Table 6. (con't)

Rank	Author	ID of author in Scopus	First publication year*	TP	h-index	TC	Current affiliation	Country
11	Ali, S.H.	57205023059	2020a	4	2	31	New York University,	United States
12	Bakri, F.G.	8394464300	2020c	4	3	38	The University of Jordan	Jordan
13	Basch, C.E.	7006557295	2020c	4	3	52	Columbia University	United States
14	Capasso, A.	54898455200	2020c	4	2	31	New York University	United States
15	Chen, C.	56433916200	2020c	4	4	44	University of Toronto	Canada

Note*= [year]a: First author; [year]b: Second author; [year]c: Third author or above;

TP=Total publications; TC=Total citations

Author Keyword Analysis

Before the thesaurus file was created, 234 author keywords were listed, in which 24% (55 author keywords) were used five times, 17% (39 author keywords) used six times, 9% (21 author keywords) used seven times, 3% (8 author keywords) used eight times, 7% (16 author keywords) used nine times, and 41% (95 author keywords) used 10 times and above. To prevent similar author keywords from being analysed, the keywords were re-labelled in the thesaurus file. After processing the thesaurus file, 182 author keywords (a minimum of five occurrences) were obtained. Figure 3 presents the bibliometric map of author keywords, which will be discussed in the next section.

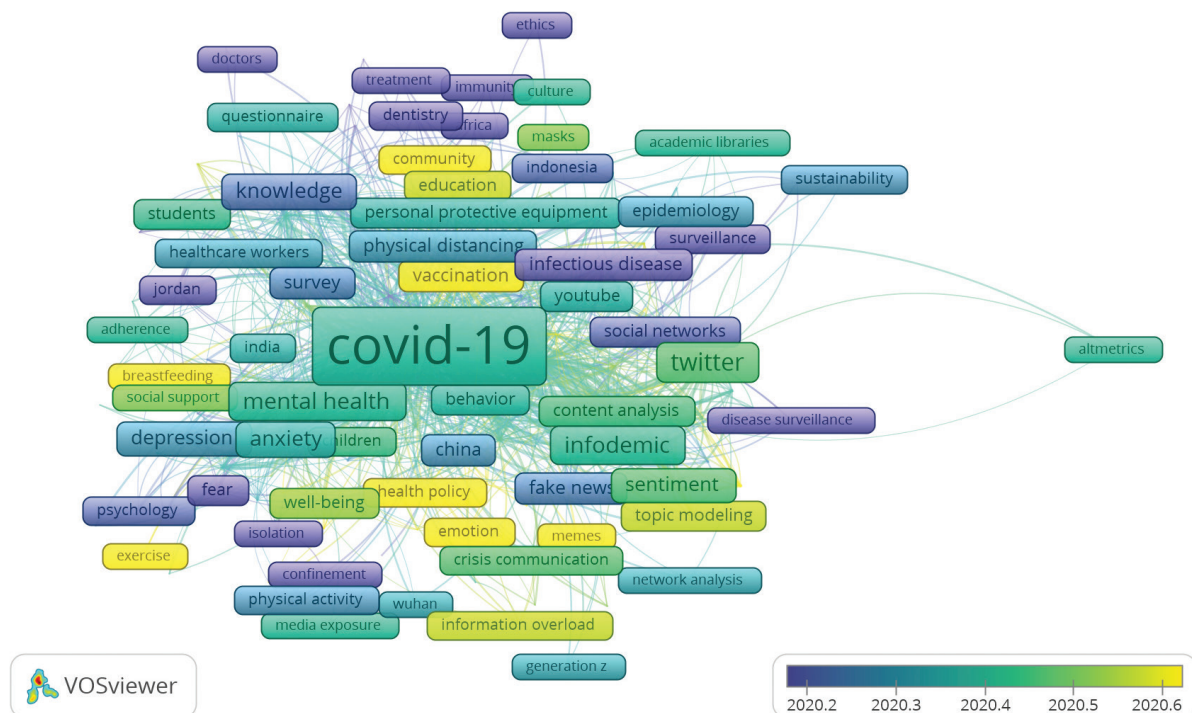


Figure 3. The bibliometric map of author keywords (Minimum number of occurrences: 5)

DISCUSSION

Concept and Terminology

This section provides the concept and terminology of the selected keywords in the search strategy, which were “social media” and “COVID-19”. Based on the results of the analysis, a few keywords were found to conceptualise COVID-19. The keyword “COVID-19” itself has the most occurrences as it was the main keyword in this finding, where it had 1,317 occurrences and 181 links with other keywords. Further, keywords of “pandemic” (228 occurrences, 140 links), “outbreak” (19 occurrences, 27 links), “crisis” (12 occurrences, 27 links), and “epidemic” (11 occurrences, 30 links) were frequently used by scholars to describe COVID-19. During the COVID-19 pandemic, “lockdowns” (46 occurrences, 52 links) became one of the measures adopted to reduce the infection rate because COVID-19 is known as an “infectious disease” (36 occurrences, 37 links). Besides lockdown, other measures such as “physical distancing” (33 occurrences, 38 links), “quarantine” (25 occurrences, 33 links), and “vaccination” (33 occurrences, 50 links) had been frequently mentioned by past scholars as well.

As for “social media” (464 occurrences, 146 links), a few platforms were mentioned in the analysis, such as “Twitter” (123 occurrences, 75 links), “Facebook” (20 occurrences, 37 links), “YouTube” (19 occurrences, 31 links), “Sina Weibo” (14 occurrences, 26 links), “Instagram” (10 occurrences, 20 links), and “WhatsApp” (10 occurrences, 17 links). Clearly, Twitter stands out as the most discussed platform when social media is mentioned in research. This is consistent with the results shown in Table 2, where one of the most cited papers is “Top concerns of tweeters during the COVID-19 pandemic: A surveillance study” by Abd-Alrazaq et al. (2020).

Sina Weibo had more occurrences than Instagram; this is most likely as since the first outbreak started in China, COVID-19 became a hot topic in their own country’s social media platform. In social media, people have been using “social networks” (23 occurrences, 31 links) to share the information to ensure that their friends and families are updated with the latest news. The next sub-section will look at the roles of social media as well as the consequences and effects when social media is used inappropriately during the pandemic.

Topics of Interest

Due to its role in disseminating information to the public, especially in this pandemic, the public has come to rely on social media for information, to a certain extent. The author keyword analysis reveals several keywords related to the roles of social media. The top three author keywords are “knowledge” (75 occurrences, 54 links), “attitude” (52 occurrences, 44 links), and “perception” (37 occurrences, 55 links). Based on this result, social media can be linked to providing knowledge as well as affecting public attitude and perception. This finding corroborates with that of Xu et al. (2020), where 84.7% of the respondents relied on Sina Weibo (14 occurrences, 26 links) to keep themselves updated about COVID-19.

Social media could also affect public attitude towards COVID-19, whereby any community that has obtained sufficient knowledge of COVID-19, tends to demonstrate a positive attitude and perception in facing the pandemic (Khasawneh et al., 2020). In addition, it is also believed that the social media users’ perception towards the risk of the virus could also be affected by the content of social media posts they encounter (Malecki, Keating, & Safdar, 2021). This is consistent with the search results presented in Table 2, where one of the most cited papers is “Medical students and COVID-19: Knowledge, attitudes, and precautionary measures. A descriptive study from Jordan” by Khasawneh et al. (2020).

Besides providing knowledge and affecting the attitude and perception of the public, social media plays other roles in the pandemic as well. For instance, it is helpful in assisting researchers conduct “infoveillance” (32 occurrences, 48 links) studies to characterise public knowledge, attitudes, and behaviour during the pandemic, such as the infoveillance study of Li, Cuomo, Purushothaman, and Mackey (2020). In this study, the scholars examined the classifications of social media posts to trace the trend of discussion. Social media platforms can also be used to share and disseminate health information rapidly (Chukwuyere, Nwanneka, Chukwudebelu, & Chidiebere, 2020), hence several author keywords related to this role were also found, such as “health communication” (27 occurrences, 32 links), “medical education” (14 occurrences, 17 links), and “telemedicine” (29 occurrences, 26 links). In addition to disseminating information, researchers also use social media to analyse public opinion of the pandemic, such as the work of Han, Wang, Zhang, and Wang (2020). Hence, keywords such as “survey” (35 occurrences, 48 links), “data mining” (23 occurrences, 29 links), and “public opinion” (9 occurrences, 16 links) were also revealed by the analysis.

Not surprisingly, those affected by the virus treat social media platforms as a medium to share health information, to some extent. This is because, even before the pandemic, netizens have been taking advantage of the easy access to general health information online to evaluate and assess their own health risks for other diseases or ailments (Roundtree, 2017). Hence, this explains why social media users would rely on social media posts during the pandemic. Further, when related authorities share health announcements and updates using official accounts, this reinforces further the behaviour of netizens to explore health information through social media (Meadows, Meadows, Tang, & Liu, 2019).

When social media is utilised as one of the major platforms to disseminate information related to the pandemic, several issues emerge. One of the major issues is related to one of the top keywords, which is “infodemic” (82 occurrences, 67 links). Too much information on the pandemic from social media can confuse the public, which can lead to an infodemic (Lin, 2020). Several other issues related to infodemic can be identified from the author keyword analysis as well. These issues include “misinformation” (67 occurrences, 49 links), “fake news” (39 occurrences, 34 links), “disinformation” (9 occurrences, 12 links), and “information overload” (9 occurrences, 13 links). The author keyword analysis results are consistent with the list of most cited papers in Table 2, where one of the papers discusses about fake news in COVID-19, namely “Inoculating against fake news about COVID-19” by Van der Linden et al. (2020). According to the World Health Organization (WHO), misinformation caused by social media can be categorised into four types: (a) the origins of COVID-19; (b) the symptoms of COVID-19; (c) treatment and cure of COVID-19; and (d) the intervention of authorities or government (2020).

On social media platforms, the proliferation of fake news amongst random social media users seems inevitable. The COVID-19 pandemic is no exception (Apuke & Omar, 2021). Unfortunately, the rampant spread of fake news or misinformation of COVID-19 has affected considerably the mental state of netizens (Hou, Du, Jiang, Zhou, & Lin, 2020). Although misinformation and fake news has become a major threatening issue for social media users, there is a dearth of studies on the factors that contribute to this phenomenon (Waszak, Kasprzycka-Waszak, & Kubanek, 2018). The inability to prevent or mitigate these misinformation issues could bring negative impacts, particularly to public mental health.

The impacts from social media have been widely discussed. This explains the ranking of “public health” (100 occurrences, 93 links) “mental health” (90 occurrences, 77 links), and “global health” (6 occurrences, 12 links) as the top author keywords in regard to the negative impacts of infodemic. Several other keywords related to mental health issues were

found as well, such as “anxiety” (80 occurrences, 70 links), “depression” (57 occurrences, 39 links), “psychological distress” (53 occurrences, 42 links), “fear” (16 occurrences, 23 links), “insomnia” (7 occurrences, 14 links), and “PTSD” (7 occurrences, 7 links). The extensive discussion on this topic is reflected in Table 2, where 50% of the most cited papers is about mental health. For example, “Mental health problems and social media exposure during COVID-19 outbreak” by Gao et al. (2020) had the highest citation among the top 10 most cited papers. Hence, this confirms that the improper usage of social media could bring negative effects to the public, especially on public mental health. Although social media could bring negative impacts to the public, certain groups of people also depended on social media to reduce their “loneliness” (8 occurrences, 11 links) when social distancing measures were implemented.

To reduce the likelihood of mental illnesses developing amongst social media users, several scholars have suggested interventions. For instance, it is suggested that public health agencies and other relevant authorities should be sensitive in posting health information as fake news might trigger anxiety and fearfulness amongst netizens (Zhao & Zhou, 2020). In addition to this, scholars also believe that the inability to confirm the authenticity of news articles could be one of the major contributing factors for mental illness. Hence, they suggest that governments should instil social media literacy in netizens via relevant authorities (such as Ministry of Communication) (Yang, Liu, Li, & Shu, 2020).

LIMITATIONS AND IMPLICATIONS

For this study, the keyword search strategy had restricted ‘Social Media and COVID-19’ to titles and abstracts only. As such, there is a possibility that other journal articles on social media and COVID-19 could have been overlooked. In addition, some scholars might have not used the keywords “social media and COVID-19” for their studies and may have opted to examine a specific social media platform such as Facebook and/or Instagram instead.

Thus, future research should compare studies on social media and COVID-19 in various databases, for example, between Web of Science (WOS) and Scopus, to obtain a more comprehensive result. Another limitation of this study is that the research was conducted for only the first four months of 2021, therefore, studies on social media and COVID-19 for the remainder of 2021 remain unexamined. Nevertheless, the findings of this present study can guide future research related to social media and COVID-19.

Despite the limitations outlined earlier, the findings of this bibliometric analysis have a number of significant implications for policy makers and related authorities, specifically in the public healthcare sector. One of the latest author keywords found in this analysis was “health policy”. Social media platforms are increasingly used as a platform for users to freely express their opinions or feedback. As such, it is recommended that the development of healthcare policies should incorporate opinions from social media posts, specifically those of medical staff (Anders, 2021). To a certain extent, social media posts can help the top management or decision makers to better understand the concerns or issues that plague their workforce to formulate better policies. Besides, the authorities could also effectively utilise social media to promote health policies to the public rapidly and extensively (Massaad & Cherfan, 2020). Through consistent and accurate communication, the public’s risk perception can be improved and help overcome unnecessary anxiety (Huynh, 2020).

Additionally, the present study can act as a baseline data for future research on social media and COVID-19. “Older adults” (average publication year: 2020.8) and “health policy” (average publication year: 2020.75) were some of the author keywords that may

require further examination by researchers. In the social media context, older adults are always left out as they are not familiar with the technology. However, their perceptions or opinions could be just as interesting to warrant further investigation. At one point in time, COVID-19 was regarded as “Boomer Remover” to remove the older generation due to overpopulation and became a trending topic on some social media platforms, such as Twitter (Meisner, 2020). It would be interesting to investigate the perception of the older generation towards this sentiment on social media.

Furthermore, this bibliometric analysis also contributes to the social science literature in terms of the impacts of social media on public mental health. As discussed earlier, misinformation can greatly affect the mental state of netizens, and social scientists can investigate the suitable types of intervention to manage misinformation, as well as address the mental health issues amongst netizens. The analysis also highlighted the role of social media as a knowledge provider platform and future research can fruitfully explore approaches for effective knowledge management on social media.

CONCLUSION

The bibliometric analysis clarified the research trend of social media and COVID-19 based on 1,994 related journal articles retrieved from the Scopus database. Scholarly work on this particular topic has been gradually increasing since the start of the pandemic. The analysis results show that US and UK are the leading countries studying social media and COVID-19. Based on the co-authorship analysis, India had the greatest number of collaborations with other countries. On another note, other countries such as Spain, Saudi Arabia, and Brazil are recommended to embark on more collaborations to widen their research track on social media and COVID-19.

The research topic was found to be an active research topic in the disciplines of medicine and social sciences. Further, “older adults” and “health policy” are potential future research topics to understand better social media’s role in COVID-19. These new variables could be topics of concern, where the researchers could measure the readiness of older adults in using social media to obtain information, or how health policies could promote the role of social media, as well as to prevent widespread misinformation.

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References

- Abd-Alrazaq, A., Alhuwail, D., Househ, M., Hamdi, M., & Shah, Z. (2020). Top concerns of tweeters during the COVID-19 pandemic: Infoveillance study. *Journal of Medical Internet Research*, 22(4), e19016.
- Ahmad, A. R., & Murad, H. R. (2020). The impact of social media on panic during the COVID-19 pandemic in Iraqi Kurdistan: online questionnaire study. *Journal of Medical Internet Research*, 22(5), e19556.
- Anders, R. L. (2021). Engaging nurses in health policy in the era of COVID-19. *Nursing Forum*, 56(1), 89–94.
- Apuke, O. D., & Omar, B. (2021). Fake news and COVID-19: modelling the predictors of fake news sharing among social media users. *Telematics and Informatics*, 56, 101475.
- Caubergh, V., Van Wesenbeeck, I., De Jans, S., Hudders, L., & Ponnet, K. (2021). How adolescents use social media to cope with feelings of loneliness and anxiety during COVID-19 lockdown. *Cyberpsychology, Behavior, and Social Networking*, 24(4), 250–257.

- Chukwuyere, A. E., Nwanneka, O. I., Chukwudebelu, C. C., & Chidiebere, E. B. (2020). Librarians' use of social media in disseminating health information on COVID-19. *International Journal of Research and Review*, 7(7), 443–454.
- Cinelli, M., Quattrocioni, W., Galeazzi, A., Valensise, C. M., Brugnoli, E., Schmidt, A. L., ... & Scala, A. (2020). The covid-19 social media infodemic. *Scientific Reports*, 10(1), 1–10.
- Cobo, M. J., López-Herrera, A. G., Herrera-Viedma, E., & Herrera, F. (2011). Science mapping software tools: Review, analysis, and cooperative study among tools. *Journal of the American Society for information Science and Technology*, 62(7), 1382–1402.
- Freiling, I., Krause, N. M., Scheufele, D. A., & Brossard, D. (2021). Believing and sharing misinformation, fact-checks, and accurate information on social media: The role of anxiety during COVID-19. *New Media & Society*, 14614448211011451.
- Gao, J., Zheng, P., Jia, Y., Chen, H., Mao, Y., Chen, S., ... Dai, J., 2020. Mental health problems and social media exposure during COVID-19 outbreak. *Plos One*, 15(4), e0231924.
- Han, X., Wang, J., Zhang, M., & Wang, X. (2020). Using social media to mine and analyze public opinion related to COVID-19 in China. *International Journal of Environmental Research and Public Health*, 17(8), 2788.
- Hashim, K. F., Rashid, A., & Atalla, S. (2018). Social media for teaching and learning within higher education institution: A bibliometric analysis of the literature (2008-2018). *International Journal of Interactive Mobile Technologies*, 12(7), 4–19.
- Hou, Z., Du, F., Jiang, H., Zhou, X., & Lin, L. (2020). Assessment of public attention, risk perception, emotional and behavioural responses to the COVID-19 outbreak: Social media surveillance in China. *MedRxiv*. <https://doi.org/10.1101/2020.03.14.20035956>
- Hussain, W. (2020). Role of social media in covid-19 pandemic. *The International Journal of Frontier Sciences*, 4(2), 59–60.
- Huynh, T. L. (2020). The COVID-19 risk perception: A survey on socioeconomics and media attention. *Economics Bulletin*, 40(1), 758–764.
- Jia, R., Ayling, K., Chalder, T., Massey, A., Broadbent, E., Coupland, C. & Vedhara, K., (2020). Mental health in the UK during the COVID-19 pandemic: cross-sectional analyses from a community cohort study. *BMJ Open*, 10(9), e040620.
- Kaya, T., Sağsan, M., Medeni, T., Medeni, T., & Yıldız, M. (2020). Qualitative analysis to determine decision-makers' attitudes towards e-government services in a de-facto state. *Journal of Information, Communication and Ethics in Society*, 18(4), 609–629.
- Khasawneh, A.I., Humeidan, A.A., Alsulaiman, J.W., Bloukh, S., Ramadan, M., Al-Shatanawi, T.N., ... Saleh, T., (2020). Medical students and COVID-19: Knowledge, attitudes, and precautionary measures. A descriptive study from Jordan. *Frontiers in Public Health*, 8, 253.
- Khudzari, J. M., Kurian, J., Tartakovsky, B., & Raghavan, G. V. (2018). Bibliometric analysis of global research trends on microbial fuel cells using Scopus database. *Biochemical Engineering Journal*, 136, 51–60.
- La, V.P., Pham, T.H., Ho, M.T., Nguyen, M.H., P Nguyen, K.L., Vuong, T.T., ... Vuong, Q.H., (2020). Policy response, social media and science journalism for the sustainability of the public health system amid the COVID-19 outbreak: The Vietnam lessons. *Sustainability*, 12(7), 2931.
- Li, J., Xu, Q., Cuomo, R., Purushothaman, V., & Mackey, T. (2020). Data mining and content analysis of the Chinese social media platform Weibo during the early COVID-19 outbreak: Retrospective observational infoveillance study. *JMIR Public Health and Surveillance*, 6(2), e18700.
- Lin, C. A. (2020). A year like no other: A call to curb the infodemic and depoliticize a pandemic crisis. *Journal of Broadcasting & Electronic Media*, 64(5), 661–671.
- Malecki, K. M., Keating, J. A., & Safdar, N. (2021). Crisis communication and public perception of COVID-19 risk in the era of social media. *Clinical Infectious Diseases*, 72(4), 697–702.
- Massaad, E., & Cherfan, P. (2020). Social media data analytics on telehealth during the COVID-19 pandemic. *Cureus*, 12(4), e7828.
- Meadows, C. W., Meadows, C. Z., Tang, L., & Liu, W. (2019). Unraveling public health crises across stages: understanding twitter emotions and message types during the California measles outbreak. *Communication Studies*, 70(4), 453–469.
- Meisner, B. A. (2020). Are you OK, boomer? Intensification of ageism and intergenerational tensions on social media amid COVID-19. *Leisure Sciences*, 43(1–2), 56–61.
- Naeem, S. B., & Bhatti, R. (2020). The Covid-19 'infodemic': A new front for information professionals. *Health Information & Libraries Journal*, 37(3), 233–239.

- Neog, S. (2020). Library services through social media during lockdown due to COVID-19 with special reference to university libraries of Assam. *Library Philosophy and Practice*, 4262.
- Nguyen, M.H., Gruber, J., Fuchs, J., Marler, W., Hunsaker, A., & Hargittai, E. (2020). Changes in digital communication during the COVID-19 global pandemic: Implications for digital inequality and future research. *Social Media+ Society*, 6(3), 2056305120948255.
- Noor, S., Guo, Y., Shah, S. H. H., Nawaz, M. S., & Butt, A. S. (2020). Bibliometric analysis of social media as a platform for knowledge management. *International Journal of Knowledge Management (IJKM)*, 16(3), 33–51.
- Nusair, K., Butt, I., & Nikhashemi, S. R. (2019). A bibliometric analysis of social media in hospitality and tourism research. *International Journal of Contemporary Hospitality Management*, 31(7), 2691–2719.
- Pritchard, A. (1969). Statistical bibliography or bibliometrics. *Journal of Documentation*, 25(4), 348–349.
- Roundtree, A. K. (2017). Social health content and activity on Facebook: A survey study. *Journal of Technical Writing and Communication*, 47(3), 300–329.
- Sa'ed, H. Z., Sweileh, W. M., Awang, R., & Al-Jabi, S. W. (2018). Global trends in research related to social media in psychology: Mapping and bibliometric analysis. *International Journal of Mental Health Systems*, 12(1), 1–8.
- Shah, S. H. H., Lei, S., Ali, M., Doronin, D., & Hussain, S. T. (2019). Prosumption: bibliometric analysis using HistCite and VOSviewer. *Kybernetes*, 49(3), 1020–1045.
- Talwar, S., Dhir, A., Kaur, P., Zafar, N., & Alrasheedy, M. (2019). Why do people share fake news? Associations between the dark side of social media use and fake news sharing behavior. *Journal of Retailing and Consumer Services*, 51, 72–82.
- Tanha, M. A. (2020). Exploring the credibility and self-presentation of Insta micro-celebrities in influencing the purchasing decisions of Bangladeshi users, *SEARCH Journal of Media and Communication Research*, 12(2), 1–20.
- Times Higher Education (THE). (2020). World university rankings. Retrieved from <https://www.timeshighereducation.com/world-university-rankings>
- Van der Linden, S., Roozenbeek, J., & Compton, J. (2020). Inoculating against fake news about COVID-19. *Frontiers in Psychology*, 11, 2928.
- Waszak, P. M., Kasprzycka-Waszak, W., & Kubanek, A. (2018). The spread of medical fake news in social media—the pilot quantitative study. *Health Policy and Technology*, 7(2), 115–118.
- World Health Organization (WHO). (2020, April 15). Coronavirus disease (COVID-19) weekly epidemiological update and weekly operational update. Retrieved from <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports>
- Xu, H., Mendez, M. J. G., Guo, L., Chen, Q., Zheng, L., Chen, P., ... & Qiao, Y. (2020). Knowledge, awareness, and attitudes relating to the COVID-19 pandemic among different populations in Central China: Cross-sectional survey. *Journal of Medical Internet Research*, 22(10), e22628.
- Yang, Y., Liu, K., Li, S., & Shu, M. (2020). Social media activities, emotion regulation strategies, and their interactions on people's mental health in COVID-19 pandemic. *International Journal of Environmental Research and Public Health*, 17(23), 8931.
- Zhang, C., Yang, L., Liu, S., Ma, S., Wang, Y., Cai, Z., ... Zhang, J., (2020). Survey of insomnia and related social psychological factors among medical staff involved in the 2019 novel coronavirus disease outbreak. *Frontiers in Psychiatry*, 11, 306.
- Zhang, Y., Ma, Z. F. (2020). Impact of the COVID-19 pandemic on mental health and quality of life among local residents in Liaoning Province, China: A cross-sectional study. *International Journal of Environmental Research and Public Health*, 17(7), 2381.
- Zhao, N., & Zhou, G. (2020). Social media use and mental health during the COVID-19 pandemic: Moderator role of disaster stressor and mediator role of negative affect. *Applied Psychology: Health and Well-Being*, 12(4), 1019–1038.
- Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational Research Methods*, 18(3), 429–472.

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