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A bibliometric analysis of COVID-19 publications in nursing by visual mapping method

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Abstract

Aim: This study conducted a bibliometric analysis of nursing publications on the COVID-19 between 1 January 2020, and 24 October 2021.

Background: COVID-19 has been a hot research topic that has attracted many researchers from various disciplines. One of the ways to combat the COVID-19 pandemic is to produce knowledge and present it with a holistic approach. Therefore, it is crucial to make bibliometric and content analyses of scientific publications. Scientific data should be evaluated to keep up with the developments in the nursing profession and practices during the COVID-19 pandemic.

Methods: Data were collected from the Web of Science database. The sample consisted of 1280 publications that met the inclusion criteria. The data were analysed using descriptive content and bibliometric analysis. The VOSviewer, a mapping and visualization software program, was used for bibliometric analysis.

Results: The United States is one of the countries with the highest number of publications, citations and international cooperation during the pandemic. Of all these publications, 1183 (92.42%) are original articles. The *Journal of Nursing Management* has the highest number of publications and citations. The publications focus primarily on the topics of COVID-19, pandemic, nursing, coronavirus and nurses. The current topics that the publications address are online education, online learning, practice, nursing student, perceived stress, stress, fear, quality of life and experience to determine the impacts of the pandemic on mental health nursing education.

Conclusions: The COVID-19 pandemic has an impact on nursing, and the number of publications is increasing worldwide. In the early days of the pandemic, researchers focused on the topics of coronavirus infections, infection control, global health, health policy and nursing policy. Afterward, they addressed current topics, such as education and the psychological effects of the pandemic.

Implications for nursing management: Our results will help nurse managers identify issues related to COVID-19 that have not been researched yet and have not been adequately explained in their own institutions. They will also help them choose appropriate journals to get their studies published, appropriate countries to cooperate with and access information about the studies on the subject matter. Our results

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will also help them make evidence-based decisions about mental health and nursing education.

1 | INTRODUCTION

The novel coronavirus disease (COVID-19) is an infectious disease with high morbidity and mortality and a significant impact on health care professionals and society. The novel coronavirus disease broke out in Wuhan/China at the end of 2019 and spread to 216 countries as of 11 June 2020. The World Health Organization declared it a pandemic, which has been a global health problem (Lippi et al., 2020; World Health Organization [WHO], 2020).

Countries have developed emergency action plans in health care, economy and social life against the COVID-19 pandemic and introduced numerous preventive measures and restrictions with the integration of the pandemic with 'controlled social life' (United Nations Educational Scientific and Cultural [UNESCO], 2020). Therefore, the COVID-19 has attracted many researchers from various disciplines in a short time. Research on COVID-19 is of great significance both for controlling the disease and caring for and treating patients (Chahrour et al., 2020). Using bibliometric methods to analyse the results of studies on pandemics helps us identify, understand and solve problems (Zhang et al., 2020). We should employ bibliometric methods to evaluate published articles to keep the global impacts of COVID-19 under control, to reduce infection rates and to develop and improve treatment, care, and prevention methods. The results of bibliometric analysis studies also help nurse managers and researchers make the most appropriate decisions and predict future developments (Furstenau et al., 2021; Tao et al., 2020).

2 | OBJECTIVE

The COVID-19 pandemic has underlined the importance of the nursing profession worldwide. Scientific studies have gained momentum in nursing, as in every field. In times of crisis, evidence-based information is a key for all nurses to deliver optimal care. In addition, the bibliometric analysis of scientific publications provides an in-depth perspective and helps researchers keep up with advances in nursing and nursing practices and make necessary improvements. However, there is limited bibliometric analysis on this topic (Hao et al., 2020; Oh & Kim, 2020). This study will fill this gap. This study aims to use bibliometric analysis techniques to define the current status of publications on COVID-19 in nursing, identify gaps in the literature and offer suggestions about those gaps and present a holistic picture of the topic of COVID-19. In this way, it will help nurse researchers familiarize themselves with the nascent field of COVID-19 and keep up with related developments. It will summarize the results of current scientific publications and help make them more visible. The research questions in line with the purpose of the study are as follows:

The research question: What is the current knowledge structure and development of publications on nursing and COVID-19?

- What is the distribution of the number of studies published between 2020 and 2021?
- What countries publish the most publications?
- What journals have published the most publications?
- What are the most cited (most influential) journals, publications, authors and countries?
- What kind of cooperation exists between authors and between countries?
- What are the most studied topics or concepts depending on the keywords of publications?

3 | METHOD

This study used bibliometric analysis techniques to fulfil the purpose of the research and to find answers to the research questions.

Bibliometric: Bibliometrics, which is a quantitative analysis, provides significant convenience in identifying studies that represent a topic (Şimşir, 2021, p. 16). This study used citation analysis, co-author analysis and co-word analysis, which are bibliometric analysis techniques. The citation analysis focuses on the number of citations to reveal the impact of articles, authors, journals and countries. Before doing research on the topic, we can quickly identify the most influential articles, authors, journals and countries through citation analysis (Bağış, 2021, p. 99; Erdoğan, 2021). The co-author analysis involves the participation of two or more authors in producing a publication. This analysis provides us with an image of social networks that emerge as a result of collaborations between authors and between countries (Huang & Chang, 2011; Talan, 2021). The main point of a co-word analysis is words. Therefore, we used co-word analysis to examine the relationship between concepts or words in the titles, abstracts or keywords of studies in a research field (Bağış, 2021, p. 107). This study used only co-occurrence of keyword analysis for co-word analysis.

3.1 | Data collection

The data were collected from the Web of Science Core Collection (WoSCC), which was screened for relevant publications between 1 January 2020 and 24 October 2021. The literature review was

conducted using keywords: 'Coronavirus' OR 'COVID-19' OR '2019 novel coronavirus disease' OR '2019-nCoV disease' OR '2019-nCoV infection' OR 'coronavirus disease 2019' OR 'coronavirus disease 19'. Then, the results were filtered in the WoS database according to category (nursing), time period (2020–2021), index (Science Citation Index Expanded [SCI-EXPANDED], Social Science Citation Index [SSCI] and Emerging Sources Citation Index [EMERGING SCI]), publication type (original articles and review articles only) and languages (no filtration in publication language). As a result of these inclusion criteria, 1367 publications were reached. Titles, abstracts or full texts were read and evaluated to identify whether they met the research topic. The exclusion criteria were as follows: (1) publications with no keywords; (2) non-nursing category; (3) publications without abstract; (4) repeated publications; and (5) publications not officially published. Finally, a total of 1280 publications were retrieved. All the bibliographic data were exported from the WoS database to an Excel spreadsheet ('savedrecs.xls').

3.2 | Data analysis

The data were analysed using descriptive content and bibliometric content analysis. The descriptive content analysis was performed on WoSCC. The bibliometric analysis was performed using the VOSviewer (Version 1.6.17, Center for Science and Technology Studies of Leiden University), a mapping and visualization software tool. Descriptive characteristics (distribution of publications by years, publication type and language and the most cited first publication or journals) were analysed using the Excel program. Then tables and figures were generated. An Excel cartogram map was used to visualize the country data of the publications. The VOSviewer was used to visualize the relationship and collaboration network between publications, journals, authors, countries and the frequency of co-words in the keywords. The number of COVID-19 cases of the countries on the day when the data were last recorded (24 October 2021) was also examined.

4 | FINDINGS

4.1 | Descriptive findings

Figure 1 shows the distribution of the publications published in WoS by year, type and language. The number of publications published in

2020 and 2021 (October 24) was 459 and 821, respectively. Of those publications, 1183 were original articles, and 1208 were in English.

4.2 | Global analysis of publications

Figure 2 shows the world map image of the distribution of the publications on nursing and COVID-19 published in 81 countries. Darker colors indicate more publications. In addition, Table 1 shows the number of publications on COVID-19 and the total confirmed COVID-19 cases in the first 10 countries. Most publications were published in the United States (548 publications), followed by China (145 publications) and Spain (79 publications). However, the top three countries with the most COVID-19 cases were the United States ($n = 45,406.263$), India ($n = 34,175.468$) and Brazil ($n = 21,723.559$) (News Google, 2021).

4.3 | Bibliometric findings

4.3.1 | Citation analysis (journal, author, document and country)

The first step of the bibliometric analysis was a citation analysis conducted on the publications accessed on WoSCC. Table 2 shows the number of citations of the 10 most cited publications.

Of the 1280 publications examined, 20 publications had at least 30 citations. Table 2 shows that the most cited article was 'Work stress among Chinese nurses to support Wuhan in fighting against COVID-19 epidemic' by Mo et al. (2020; 211 citations), followed by Labrague and de los santos (Labrague & de los Santos, 2020; 131 citations) and Fernandez et al. (2020; 107 citations).

Within the scope of this study, citation analysis was performed to determine the most cited authors in the field of COVID-19. It was determined that the total number of authors in the publications examined was 5375. The study focused on 226 authors with at least two publications and six citations. Each colour represented a cluster. There were nine clusters (Figure 3), and the most cited authors were in the same cluster. Among these clusters, the red and orange clusters in the centre are larger and more prominent than the others. These two clusters show that the most-cited authors are included and have more detailed relationships with many clusters. The Chinese researchers,
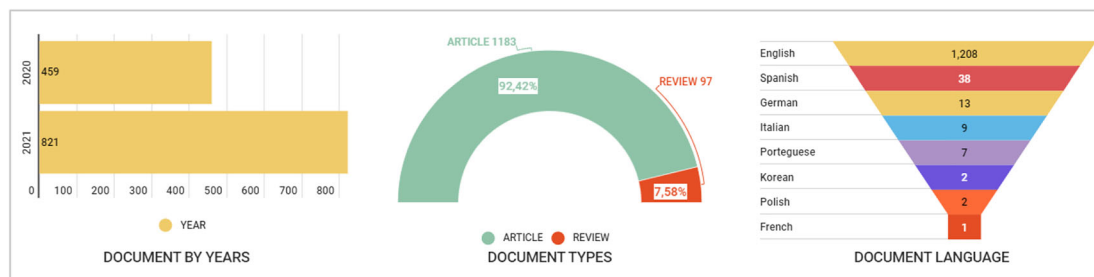

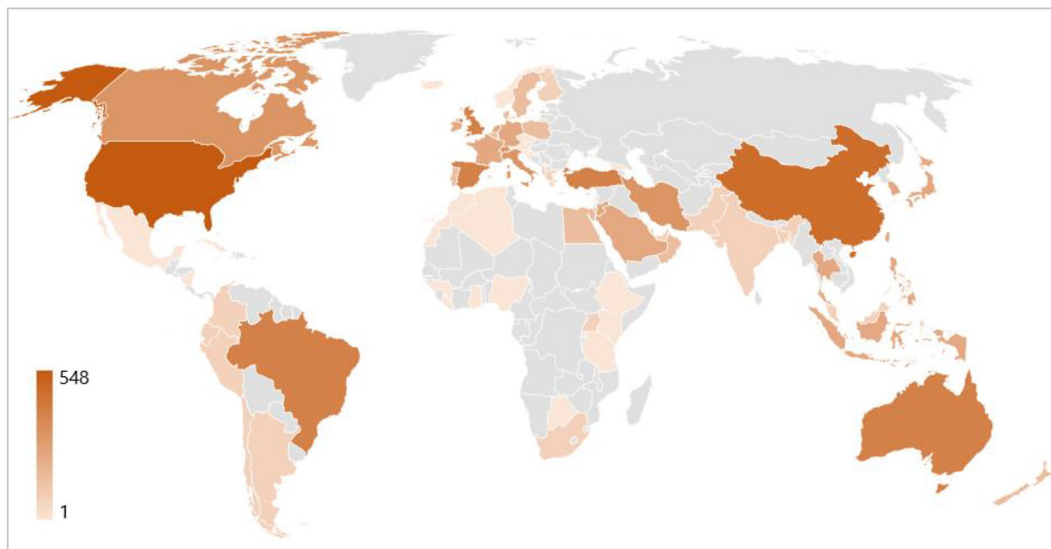**FIGURE 1** Distribution of publications by year, type and language

FIGURE 2 Geographical distribution of COVID-19 publications (*Note*: regions with no colors in the map have no available data)

TABLE 1 Top 10 countries with the most publications and COVID-19 cases (24 October 2021)

Publications by country			Total number of cases by country			
No	Country	Number of publications	No.	Country	Total number of cases	Number of deaths
1	USA	548	1	USA	45,406,263	735,964
2	China	145	2	India	34,175,468	454,269
3	Spain	79	3	Brazil	21,723,559	605,457
4	Australia	75	4	United Kingdom	8,734,934	139,461
5	Brazil	69	5	Russia	8,078,309	225,417
6	Turkey	60	6	Turkey	7,826,983	68,917
7	England	53	7	France	6,944,163	115,107
8	Italy	43	8	Iran	5,851,670	125,052
9	Iran	40	9	Argentina	5,279,813	115,823
10	Canada	38	10	Spain	4,997,732	87,132

Deng L., Huang H., Lang Q., Liao C., Mo Y., Wang N. and Zhang L., were the most cited authors, with an equal number of citations (two publications, 220 citations) and seemed to collaborate. These authors were followed by Labrague L. J. (six publications, 198 citations) and de los Santos (three publications, 193 citations).

Third, citation analysis was performed on the 10 journals with the most citations. Figure 4 shows the related findings.

The 1280 publications examined were published in 135 different journals. It was determined that 18 of those journals had at least 20 publications and citations. The journal-based distribution of publications in Figure 4a showed that the *Journal of Nursing Management* had the most publications (50 publications), followed by the *Journal of Clinical Nursing* (45 publications) and the *International Nursing Review* (39 publications). The number of citations per publication in Figure 4b showed that the most cited publications were in the *Journal of Nursing Management* (617 citations), followed by the *Journal of Clinical Nursing* (342 citations) and the *International Journal of Nursing Studies*

(256 citations). According to the bibliometric analysis, there were five clusters in different colors. The yellow and green clusters were bigger and more prominent than the others. The blue, red and purple clusters were smaller and sparser. According to the whole visual network map, the most cited journal was the *Journal of Nursing Management* (yellow cluster), which was in the same cluster as the Revista Latino-Americana de Enfermagem and had a close connection with the *Journal of Clinical Nursing* (thick line extension).

Figure 5 shows the visual network map of the countries with the most citations. Of the 81 countries, 25 had at least 10 publications and citations. The United States had the most citations (958 citations), followed by China (933 citations), Australia (586 citations) and Spain (292 citations). In addition, some countries had a similar number of citations: Turkey (222 citations), England (213 citations) and the Philippines (211 citations). In addition, the visual network map had five clusters in different colors, indicating links (relationships) between countries. For example, Turkey was in the same cluster as the

TABLE 2 Most cited articles

No.	Title	Author (s), year	Journal	Total Citiation
1	Work stress among Chinese nurses to support Wuhan in fighting against COVID-19 epidemic	Mo et al. (2020)	*Journal of Nursing Management*	211
2	COVID-19 anxiety among front-line nurses: Predictive role of organisational support, personal resilience and social support	Labrague and de los Santos (2020)	*Journal of Nursing Management*	131
3	Implications for COVID-19: A systematic review of nurses experiences of working in acute care hospital settings during a respiratory pandemic	Fernandez et al. (2020)	*International Journal of Nursing Studies*	107
4	A rapid systematic review of the efficacy of face masks and respirators against coronaviruses and other respiratory transmissible viruses for the community, healthcare workers and sick patients	MacIntyre and Chughtai (2020)	*International Journal of Nursing Studies*	97
5	Anxiety and coping strategies among nursing students during the covid-19 pandemic	Savitsky et al. (2020)	*Nurse Education in Practice*	79
6	Fear of COVID-19, psychological distress, work satisfaction and turnover intention among frontline nurses	Labrague and de los Santos (2021)	*Journal of Nursing Management*	60
7	COVID-19: Facts, Cultural Considerations, and Risk of Stigmatization	Bruns et al. (2020)	*Journal of Transcultural Nursing*	50
8[a]	Psychological impact of COVID-19 outbreak on frontline nurses: A cross-sectional survey study	Nie et al. (2020)	*Journal of Clinical Nursing*	46
	Global challenges in health and health care for nurses and midwives everywhere	Catton (2020)	*International Nursing Review*	46
9	Compassion fatigue, burnout, compassion satisfaction and perceived stress in healthcare professionals during the COVID-19 health crisis in Spain	Ruiz-Fernández et al. (2020)	*Journal of Clinical Nursing*	43
10	Challenging times: ethics, nursing and the COVID-19 pandemic	Turale et al. (2020)	*International Nursing Review*	41

[a]Two articles had the same number of citations.

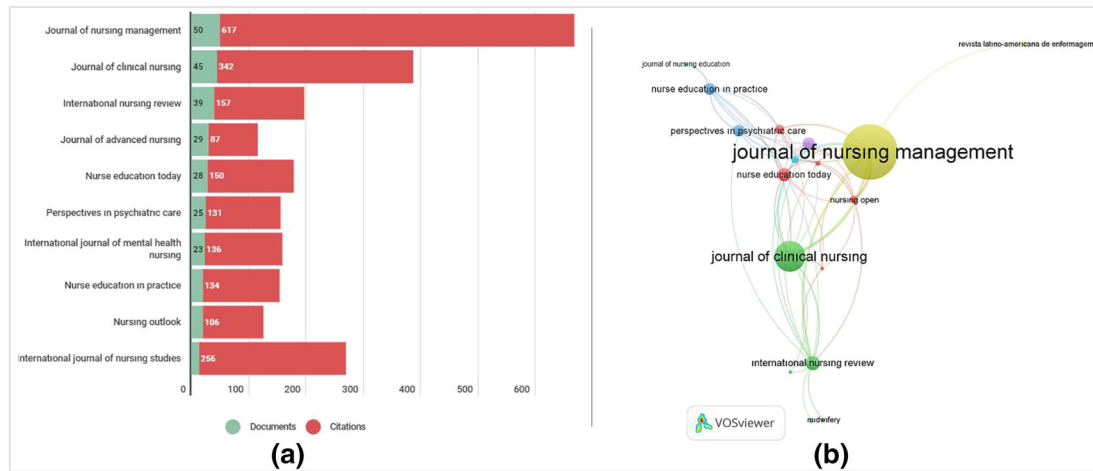**FIGURE 3** Network of most cited authors

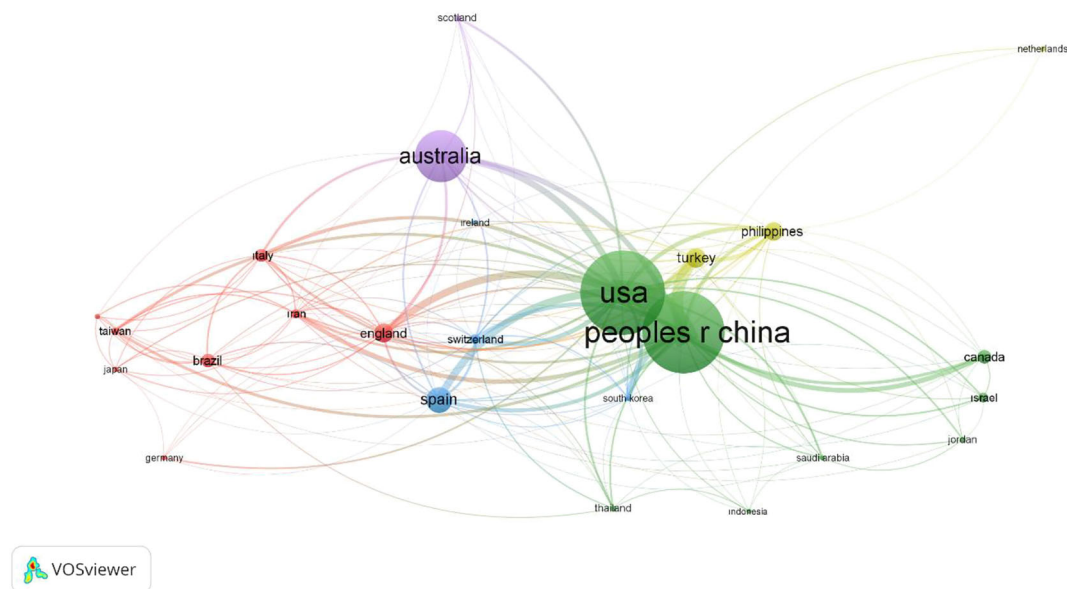**FIGURE 4** Publications and citation network of journals

FIGURE 5 Network of most cited countries

Philippines and the Netherlands, and therefore, it had the most intense relationship with those countries and the closest relationship with China.

4.3.2 | Co-author analysis (author, country)

Co-author analysis was performed on the publications. Figure 6 shows the visual network map of the co-author analysis for cooperation between authors of publications on COVID-19. Of the 5375 authors, 169 had at least two publications and 10 citations. Bigger circles in Figure 6 indicated more publications, whereas smaller circles indicated fewer publications. If there was a line between the names of two authors, it meant that the two authors worked together. The thicker this line, the more the two authors worked together. The visual network map for cooperation between authors showed that the authors in the same clusters collaborated more than once to publish publications (e.g., Jackson D. and Halcomb E.).

Figure 7 shows the visual network map of the co-author analysis for cooperation between countries regarding publications on COVID-19. The map includes eight clusters in different colors. The closer the two countries to each other in a cluster, the stronger and greater connection they had with each other. American authors collaborated the most (93 countries), followed by Australian (66 countries), British (57 countries) and Chinese authors (54 countries).
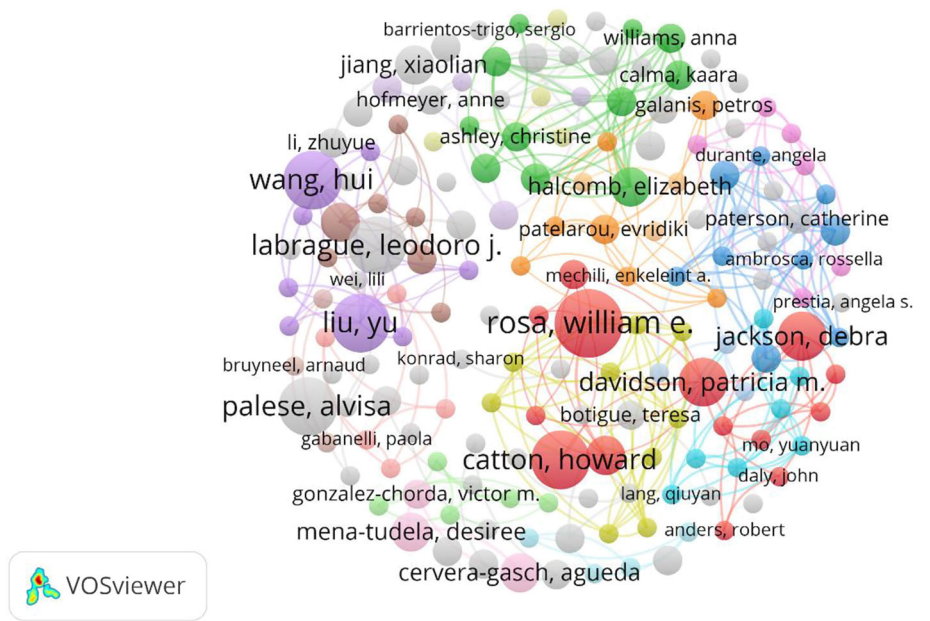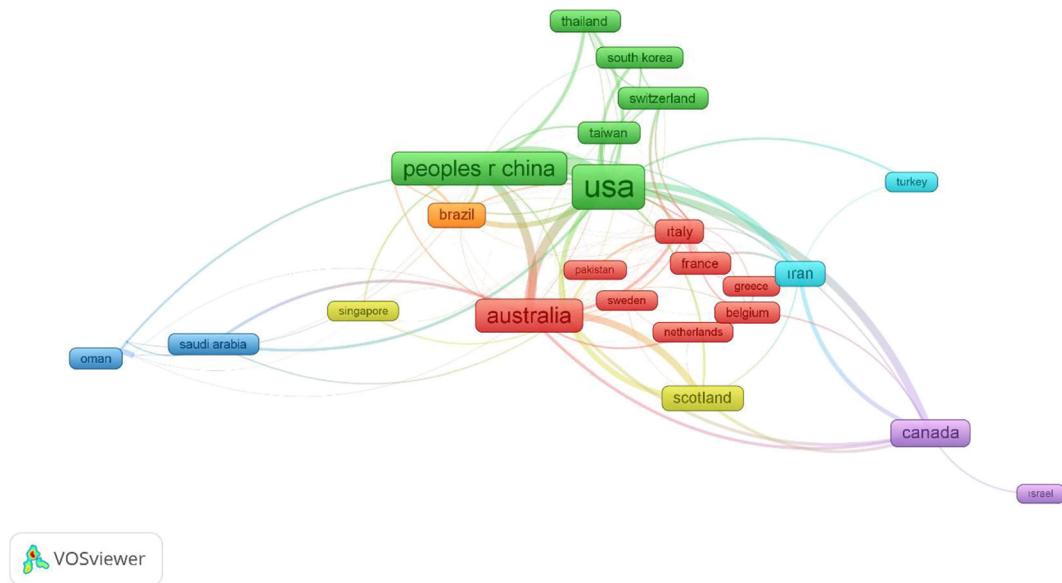
FIGURE 6 Network of co-author (author)

FIGURE 7 Network of international cooperation

4.3.3 | Co-word (co-occurrence of keyword analysis)

Figure 8a shows the visual network map of the relationship among the keywords used in the publications included in the analysis. Of the total 2504 keywords in the publications, 152 were the most common keywords (at least five times). The circle size indicated the most researched topic, whereas the yellow regions indicated current topics. In addition, the closer the two words were to each other, the more they were used in the publications. The lines between them indicated that they were used in the same publication. At the centre of the map were the keywords of 'COVID-19 (667 times)', 'pandemic (155 times)', 'nursing (144 times)', 'coronavirus (114 times)', 'nurses (106 times)' and 'pandemics (64 times)'. These words were concepts analysed with other clusters. The current topics were 'online education', 'online learning', 'practice', 'nursing student', 'perceived stress', 'stress', 'fear', 'quality of life' and 'experience'. In addition, a cloud of words was generated to show how frequently the co-words were used. Figure 8b shows the cloud of words. As in the visual network maps, bigger images in Figure 8b indicated more common words. The

FIGURE 8 Keywords network based on co-occurrence and word clouds

word 'COVID-19' was at the centre of the cloud of words, confirming the visual network map.

5 | CONCLUSION AND DISCUSSION

Since the beginning of the COVID-19 pandemic, nurse researchers have conducted scientific studies to better understand the effects of the virus and the pandemic on the nursing profession and practices. Compared with 2020, the number of publications increased rapidly in the first 10 months of 2021. Researchers have been mobilized by the emergence of a new pandemic, the crisis in its early stages, prevention and control measures and the number of cases and deaths announced for the world and countries. Researchers will continue to conduct research to identify new effects of COVID-19 because the pandemic is still going on, the number of cases worldwide is constantly increasing and measures are being taken against new variants. The number of studies on SARS and Ebola peaked 2 years after their onset (Zhang et al., 2020).

The analysis of the countries, authors or journals with the highest number of publications on the topic provides information about their productivity. The one with the highest number of publications is considered the most productive (Erdoğan, 2021). The United States and China were the most productive countries as they published the most publications on nursing and COVID-19. There is a relationship between the number of scientific publications published by countries and the duration of the COVID-19 pandemic and the level of exposure to the pandemic by those countries (Hao et al., 2020; Oh & Kim, 2020; Tao et al., 2020). The fact that the United States is the

most productive country may be related to the increasing number of cases and deaths there. Through citation analysis, it is possible to identify the most cited (or most influential) studies, authors or journals on a topic. Therefore, citation analysis provides information on the impact of studies in a particular research area and how important they are (Ozturk, 2021). Therefore, this study also focused on the publications with the highest number of citations. According to the citation analysis, the study conducted by Mo et al. (2020) was the most cited research on COVID-19. Mo et al. (2020) focused on the factors affecting the work stress in Chinese nurses caring for COVID-19 patients and found that having children, excessive weekly work hours and anxiety were major sources of stress, causing anxiety and helplessness. The study conducted by Labrague and de los Santos (2020) was the second most cited research on COVID-19. They investigated the COVID-19 anxiety in nurses and aimed to determine the effect of personal resilience, social support and organisational support on their COVID-19 anxiety. We can state that the studies conducted by Mo et al. (2020) and Labrague and de los Santos (2020) are studies most cited by researchers investigating the psychological effects of the pandemic on health care professionals or nurses between the dates when the data of the present study were collected. Although some publications were cited many times, some others were not cited at all because the latter have been recently published. A citation analysis was performed to identify key authors in this field. According to the citation analysis, the most cited authors were Deng L., Huang H., Lang Q., Liao C., Mo Y., Wang N and Zhang L., with an equal number of citations. As a result of the collaborative approach adopted by those authors, research on COVID-19 in nursing revolves around their publications.

This study also focused on journals on COVID-19 research because the two most cited publications were published in the *Journal of Nursing Management*. The *Journal of Nursing Management* has the most publications and citations, followed by the *Journal of Clinical Nursing*. The interesting point is that the *International Journal of Nursing Studies* has a weak connection but many citations and few publications. In other words, although the journal has a high number of citations, its common citation power with other journals is quite weak. This explains why the journal is not on the visual network map (Figure 4b). These journals that published the highest number of studies on the topic and were cited the most are prominent Q1 journals in the field of nursing. Moreover, pointing out the journals that published the most publications in the field of nursing on COVID-19 during the pandemic will raise researchers' awareness on the issue. The journal analysis in the present study will pave the way for further research on this topic.

Global cooperation is crucial during the COVID-19 pandemic because outbreaks are global health problems (Guimón & Narula, 2020). Global collaborative nursing research results help us cope with the epidemic, accumulate strong evidence for clinical decisions and expand knowledge about nursing interventions and their impact on patient outcomes (Oermann et al., 2008). According to the co-author analysis, co-authors produced joint publications by collaborating more than once. As in the earlier outbreaks, the World Health Organization stated that we should emphasize international cooperation to help us make more valid and reliable decisions about effective therapeutic interventions against the COVID-19 pandemic (Farooq et al., 2021). The co-author analysis showed that the authors from the United States, Australia, England and China collaborated with other countries the most. The United States and China were in the same cluster. These results indicate that international cooperation between nurse researchers is crucial during the COVID-19 pandemic.

Keyword analysis can give us information about important topics and developmental trends in nursing research during the COVID-19 pandemic (Hao et al., 2020). The frequency of these keywords indicates the most researched topics. Current issues are always changing, but they reflect fundamental issues in the field and allow us to understand research trends in the field (Liu et al., 2021). According to the common word analysis of this study, nurse researchers conducted studies on the virus learning process (COVID-19, pandemic, nursing, coronavirus, etc.) in the early stages of the COVID-19 pandemic and later focused on the effect of the pandemic on mental health (perceived stress, stress, fear, quality of life, experience, etc.) and nursing education (online education, online learning, practice, nursing student, etc.). In addition, the pandemic will continue to be an important area of research in nursing because it takes its toll on mental health and nursing education. The literature contains studies that support our results (Hamidah et al., 2020; Hossain, 2020). Researchers will likely focus on other aspects of the pandemic as it seems like it will not be over anytime soon and vaccination will change its course. Our results evaluate new opportunities potential publication areas and trends and therefore will guide academics and professionals who want to do research in this field.

6 | LIMITATIONS

Although this study has limitations, it contributes to the bibliometric analysis of publications on nursing and COVID-19. Overall, the bibliometric and content analysis in this study represents only one aspect of the scholarly debate on this topic. The publications in other databases (Pubmed, Scopus, etc.) were not included in the sample. In addition, the sample consisted only of original articles and review articles. Lastly, the publications published after 24 October 2021, were not included in the sample. However, the pandemic is still not over. Therefore, more bibliometric analyses are warranted to investigate the publications in nursing in various databases.

7 | IMPLICATIONS FOR NURSING MANAGEMENT

This study provided a global and brief perspective on the developments in research on nursing and COVID-19 in the WoS database. Generating a bibliometric map of studies on COVID-19 and nursing has several advantages. For example, it will give nurse researchers an idea of what published research focuses on and encourage them to plan new studies on aspects and issues that have not yet been researched about nursing education, nursing care, nursing management, nurses' working conditions, nurses' mental health and so on during and after the pandemic. This study will also raise nurse researchers' awareness of countries open to cooperation and help them make new collaborations. Our results will allow nurse researchers to examine the performance of journals and publications and select research topics and journals for themselves. This study will also pave the way for further research, including different databases (Pubmed, Scopus, etc.). Our results will help nurse managers identify issues related to COVID-19 that have not been researched yet and have not been adequately explained in their own institutions. They will also help them choose appropriate journals to get their studies published, appropriate countries to cooperate with and access information about the studies on the subject matter. Our results will also help them make evidence-based decisions about mental health and nursing education.

This study is important because it gives an idea about the research and publication performance of countries on nursing and COVID-19. Countries should provide incentives/support to improve the performance of their nurse researchers to conduct further research on COVID-19. This will also be reflected in the measurement results of countries' research and publication performance.

CONFLICT OF INTEREST
The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

ETHICAL APPROVAL

Ethical approval was not required for this paper.

AUTHORS' CONTRIBUTIONS

The two authors have contributed to this work as follows: study conception and design: AÇK; data collection: AÇK; data analysis and interpretation: AÇK and SA; drafting of the article: AÇK; critical revision of the article: AÇK and SA.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in Web of Science at https://www.webofscience.com/.

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