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Library Services during COVID-19 Pandemic: A Bibliometric Analysis and knowledge Mapping

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Abstract

The increased usage of libraries during the Covid-19 pandemic has been well known to science communicators, but scientific communication has not evaluated the distributions of its published findings. Thus, this study intends to identify and map library services in international publishing, particularly the Scopus database during the pandemic. Sixty-four publications in the Scopus database were assessed using the bibliometric approach and fifty-seven documents are considered. To find documents from January 2020-June 2021, the author utilized keywords such as library services AND covid-19. Microsoft excels and VOSviewer software was used to analyze the result and visualize the knowledge map. The results showed that most of the papers are dealt with favorable and adoptive library services techniques, implementation of different users demands during the pandemic. The study found the most prolific authors. Rafiq, M., Batool, S. H., Ali, A. F., & Ullah, M. received a maximum of 20 citations from a single document and Michalak R., Ortiz-Díaz E.M., Pacheco-Mendoza J., Rysavy M.D.T., Saavedra-Alamillas C. published 2 documents each. The United States of America is ranked top to publish the scholarly publication on the Library Services during the COVID-19 related documents with 21 documents. India is in the 2nd rank with eight papers, followed by Pakistan, China, Nigeria, Peru, and South Korea. As a result, publications concerning this topic have a high likelihood of emerging. The most frequent terms used by authors are COVID-19(22.90%), library services (7.01%), academic libraries (5.61%). The shift towards advanced virtual and digital services offers more than just boosting librarians and library patrons; it serves as a move to keep the library relevant in a tech-centered society.

Keywords: Bibliometric analysis, Knowledge mapping, library services, Covid-19.

1 Introduction

A library is a collection of resources, including printed and no-printed materials, in a variety of formats that is organized by information professionals or other experts, accessible physically, digitally, bibliographically, or intellectually, and provides targeted services and programs with the mission of educating, informing, or entertaining a diverse audience and the goal of stimulating individual learning and advancing society as a whole (American Library Association, 2019). Library gives physical or digital access to materials, as well as a real or virtual place (Nageswari & Thanuskodi, 2021). Physical Library services during covid-19 are hampered due to the lockdown in many countries worldwide. Many researchers have been working on mitigating the problems by adopting different strategies to offer the library services to its community. A physical library is a location inside a building where books, periodicals, print and electronic resources are maintained for people to read and borrow. Due to the advent of internet technology, the concept of a library as a physical reality has long been challenged by the rising ease and lower cost of digital services. The recent shutdown induced by the COVID-19 outbreak has expedited the dynamic trend in the utilization of digital library services. A large number of hybrid libraries exist, containing both digital and physical holdings; in certain regions, traditional libraries are still utilized alongside digital ones (Asimah, Dzogbede & Akaba, 2021).

COVID-19, caused by the Severe Acute Respiratory Syndrome (SARS-CoV-2), was initially discovered in Wuhan, China, in December 2019 and quickly spread over the country (Alam & Sultana, 2021). Till now, there have been more than 400 million cases of COVID-19, with a mortality toll of over 5.48 million people, since the time it was first identified (JHU, 2022).

During covid-19, the psychological conditions are not well enough. So reading academic and non-academic books and other reading materials is earnestly necessary, and a library is a place where readers can read their required books safely and smoothly. But due to the restriction applied by the different governments to keep a safe distance and stay home strategy, users can't go to the library.

While Covid-19 instances continue to rise, the government limits office visits and adopts tight health protocols to control the virus's spread all over the world. In addition, most areas have

enacted large-scale social restrictions and work-from-home measures because of the surge in confirmed positive cases in early 2020. Furthermore, several local governments have implemented new policies, such as banning large groups from congregating in public and enforcing flexible working hours for outbreaks (Sultana & Alam, 2020). This pandemic has motivated governmental institutions globally to improve electronic and digital services, including online libraries. During the epidemic, this application was trendy and had users in the virtual community who were desperate to connect and exchange information (Pambayun, 2021). In this regard theory of the five laws of library science (Ranganathan, 1931) can best be applied. Books should be used, and the time of getting and accessing reading materials should be minimized and ensured. As universities and other organizations began to establish discipline-based collections of digital information resources in the early 1990s, the term "digital library" became popular. Local and wide area networks were used to enable access to these resources. Since 1993, developers have been able to enable worldwide access to digital libraries thanks to the birth and growth of the World Wide Web (Singh, Mittal & Ahmad, 2007). Thus, digital services have taken place in every organization, including libraries and information services in most countries. There have been many kinds of research on the use and application of modern technologies in library services (Ahmed & Sheikh, 2020; Ajani & Buraimo, 2021; Chaputula, Abdullah & Mwale, 2020; Munshi & Ansari, 2020; Hamad, Al-Fadel & Fakhouri, 2020; Moruwawon, 2020; Ocran, Underwood & Arthur, 2020; Dei, 2020; Acheampong & Dei, 2020).

During Covid-19, library and information centers have been adapting different mode of online services towards its users' community. Libraries have transformed into a continual learning factory developing as a new genre of information centers capable of assisting the users in readjusting to a new normal condition. In the education sector, online learning has arisen as an alternative to address the limits imposed in the aftermath of the coronavirus epidemic, and it is being viewed as a viable solution to overcome the obstacles. As a result, libraries have been investigating prospective e-resource collections and giving remote access to those that may be of interest to the community in support of academic and research activities (Dadhe & Dubey, 2020). Thus, library facilities took on a different type than face-to-face services. Many library scientists and academics are taking steps to support readers in this respect. In the COVID-19 pandemic, artificial intelligence applications were used for library services and resources (Nawaz, Gomes &

Saldeen, 2020). Since 23 March 2020, the library has converted some existing resources to a multimedia format and investigated new initiatives/practices to promote the university's whole online teaching and learning (Mehta & Wang, 2020).

Numerous publications have been published in bibliometric as a research. Diverse definitions of the term bibliometrics may be discovered to help comprehend the significance of these investigations. It is a way of using mathematics and statistics to the media of written communication in order to understand the nature and course of development of a field, according to Pritchard (1969). Bibliometrics is defined by Norton (2001) as the measuring of texts and information. Furthermore, bibliometrics has seen novel applications in recent years. According to Daim et al. (2006), it aids in the exploration, organization, and analysis of enormous volumes of statistical information, allowing researchers to uncover hidden patterns that may aid in the decision-making process. According to Scopus, 7737 documents on this topic have been published until 31 August 2021, with 592 articles in 2021, 1504 in 2020, and 1021 in 2019. (Scopus, 2021). Bibliometric research on library services during the Covid-19 pandemic has been conducted very limitedly. Thus, the present will focus on covid-19 and library services related papers' bibliometric approaches.

To further understand the topic, this research is trying to answer the following questions adapted from (Zupic&Čater, 2015).

Which authors had the largest impact on the literature?

Which publications and disciplines have the most influence on a certain research area?

Which country has been so influential in the field?

Who are the specialists in a certain field of study?

What is the dynamism of a field's conceptual structure?

What are the themes linked with a certain research line?

Why bibliometric as a field of research?

In response to the vast amount of scientific information created in recent years, paired with new modes of communication, the research community came up with a measure that has given rise to a new field of study known as bibliometrics (bibliographical statistics). This makes use of mathematical and statistical analytic approaches that allow for the collection of reliable indicators of product quality and reliability. The number of documents released by an institution

or a country, as well as research groups and people with the highest levels of scientific production, may be obtained in this way (GóngoraOrjuela, 2010).As stated by Malone and Burke (2016), the use of bibliometric tools is extremely significant for research in which librarians are required to give research support services to researchers.

Since numerous scholars are publishing various publications on the library services and covid-19, it is now vital to know the research trends of those aspects. As a result, the policymakers and administration of libraries in different countries can learn the best-applied work method for their library and information services. Therefore, bibliometric analysis is one of the significant ways to find the knowledge map easily. A bibliometric study has been one of the important topics of works in the literature.

1. Review of Literatures

2.1 Library services in covid-19

The epidemic has ushered in a change not just in online higher education teaching, but also in the efficient delivery of academic library services over the internet. To meet the acute demands for library services caused by the pandemic, all librarians brainstormed ways to notify customers about the new library services in a timely manner. The modifications were communicated through the large yellow alert box at the top of the library's home page. Following that, the Coronavirus and Library Services web page (Maxwell Library, Bridgewater State University, 2020) was launched, which was regularly updated by all librarians. Simultaneously, the library has been aggressively publicizing improvements to library services through social media, email, and the library's website (Mehta & Wang, 2020).It is quite clear that public libraries throughout the globe were fast to react to the COVID-19 epidemic, not just by altering existing services but also by developing new ones in order to stay in contact with their patrons (using of digital library systems). They used social media to communicate and make changes in their operations and library service promotion, ranging from e-books and streaming media to virtual programming and back again, from virtual story-telling to online knitting groups (Micaela, 2020; Perrine, 2020; Public Library Association, 2020).

Howes et al. (2021) conducted a study on the process of adaption to remote library services during COVID-19 in the Southern Illinois university medical library. The changes came swiftly, and the librarians encountered several problems at this period, but all went successfully in the

end, and there were some significant silver linings. Several newly adopted technologies, service models, and virtual resource offers have proven to be extraordinarily beneficial, and their usage will continue long after the epidemic has ended. Similarly, a study in Ghana (Asimah, Dzogbede & Akaba, 2021) revealed that digital libraries were made accessible, routinely updated, and maintained by the library staffs of Ghana's numerous institutions. Students made good use of the library systems and were pleased with the content and quality of the materials provided on the site, as well as the system's flexibility. Students faced a few issues when utilizing the system, but these issues did not have a significant impact on the use of the digital libraries. Jana & Rout (2021) researched on the websites of the libraries in India in covid-19 time. The purpose of this research was to determine the awareness of academic libraries by evaluating 100 institutions websites against predefined assessment criteria into four categories: fundamental website information, resource discovery, resource availability, and reference services. Each library's readiness index was generated based on the availability and non-availability of the aforementioned criteria. According to the study's results, 64% of libraries fell short of the required 50% score on established criteria. The study's overall results indicate that academic libraries must enhance and modernize their web-based services in order to play a proactive role in the current and post-pandemic environment.

Adil (2020) emphasized the service models and technological implications for librarians during a pandemic. The author recommended that librarians prepare a list of accessible online resources during a pandemic and share it with their end users through websites and social media platforms, as well as attempting to give such resources to end users via online institutional repositories/library guides. Ameen (2021) examined how Pakistani libraries responded to the Covid-19 epidemic. The research was conducted via observations, readings, and discussions with intimate coworkers. It said that the epidemic has compelled stakeholders to close the digital barrier across Pakistan's socioeconomic strata. Inadequate information and communication technology (ICT) structure, access control, a lack of knowledge and digital skills, and the absence of suitable workspaces at home were recognized as some of the major impediments to providing improved services to end users.

2.2 Bibliometric approach

Bibliometrics is a computational tool for quantitatively analyzing academic papers on a particular subject using mathematical methods (Chen, Dubin, & Kim, 2014). It could also assess study accuracy, analyze key research areas, and forecast possible research directions (Yu et al., 2020). Thus, bibliometrics examines at measures including the number of publications written on a given topic, the patterns of literature production, the most prolific source titles, the most occupied countries, organizations, and authors, and the most quoted articles to research the properties of literature production. It uses quantitative methods to analyze written documents. Bibliometric studies are often used to look at a field's history and structure, the flow of information into the area, the growth of the literature, patterns of collaboration among scientists, journal impacts, and the long-term citation effect of a work (Wenjuan, Xuezi, & Tieqin, 2013; De Bellis, 2009; Garfield, 2006).

Many researchers are working on covid-19 related research on associating covid-19 with different aspects. Chahrour et al. (2020) conducted a study on bibliometric analysis of COVID-19 research activity. The researchers retrieved 564 articles from the PubMed and WHO databases. These publications come from 39 nations, accounting for 24% of the overall number of countries affected. With 377 publications, China was the country that published the most (67 percent). With 434 initial publications, Asian countries led the way in continental research operations (77 percent).

Fan et al., (2020) showed a comparison of research between the English and Chinese studies. Their survey contained a total of 143 English and 721 Chinese original research papers and reviews on COVID-19. Before 1 March 2020, the majority of the writers and institutions of the papers were from China; moreover, the distribution of authors and institutions mainly was in developing countries or more prosperous regions of China. The keywords in English publications were more diverse than those in Chinese publications. Traditional Chinese medicine was mentioned in Chinese newspapers more often than in English. Of the 143 journals published in English, 54 were written exclusively by Chinese writers, and Chinese and other foreign authors co-authored 21. Hamidah, Sriyono, & Hudha (2020) worked on also the same kind of research where they focused on the covid-19 research trends and growth in the literature by using VOSviewer software tools. Bibliometric analysis of covid-19 with business research (Verma & Gustafsson, 2020), Chinese traditional medicine (Yang et al., 2020), coronavirus vaccine development (Ahmad et al., 2021; Chen et al., 2021). According to Scopus (2021), 448

documents have already been published on bibliometric and covid-19 in the Scopus database. So, many works have been already done. However, library services in covid-19 related bibliometric analysis are absent in the literature. Therefore, this study aims to bibliometric analysis on the library services and covid-19.

3 Methodology

The approach to be used was decided once the study goals were identified. Bibliometrics is the best methodological option for this study's features (Moreno-Guerrero et al., 2020).

3.1 Data Collection

This bibliometric study preferred the query option of “title” for searching the most relevant documents in the Scopus core database. All documents related to library services and COVID-19 indexed in the Scopus from January 2020 to August, 2021 were retrieved. When we searched the Scopus database through (library AND *services* AND COVID-19), 64 documents appeared. The search did not restrict to time as covid-19 has appeared at the end of 2019. The study follows the following search process to retrieve the data (**figure 1**)

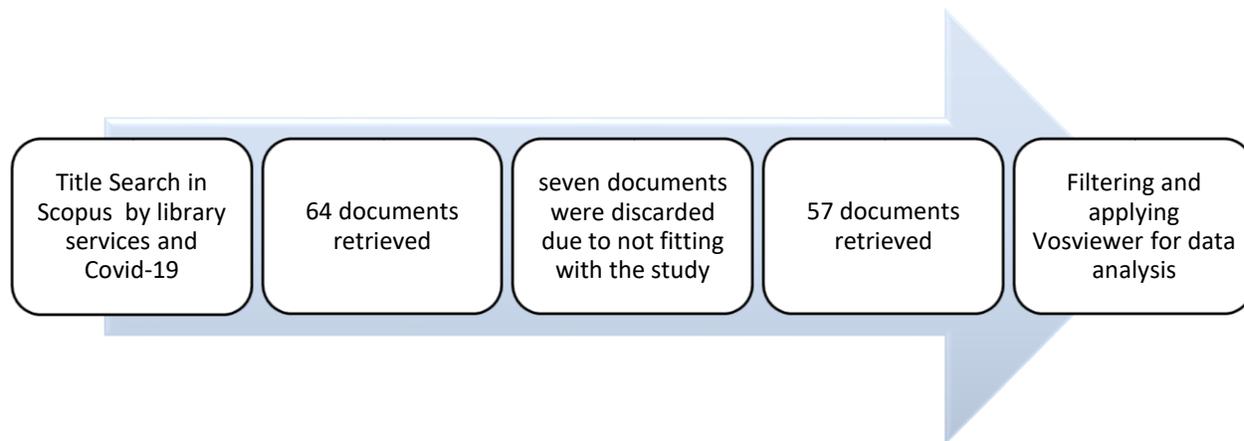


Figure 1: The search process

The new coronavirus, SARSCoV2 (coronavirus illness 2019; formerly 2019nCoV), has spread to many other nations, with the epicentre in Hubei Province of the People’s Republic of China from the end of the year 2019 (Velavan & Meyer, 2020). So all publications were taken into account irrespective of articles, review, conference paper, book chapters, review, notes etc. from January 2020 to August 2021. However, seven documents were discarded which did not cover library services and covid-19 related works. As a result, 57 documents (Table 1) were used to analyze. The following tables depict the number of retrieved documents after the search (*digitallibrary* AND *services* AND *COVID-19*). In addition, the search was done by the joint

search option with (Title, KEYWORD, ABSTRACTS) AND Title by (TITLE-ABS-KEY (library AND services AND (covid-19 OR coronavirus OR 2019-ncov OR sars-cov-2 OR cov-19)) AND TITLE (library AND services))

Types of Document	Number
Article	48
Review	3
Conference paper	4
Book chapter	1
Notes	1
Total	57

Table 1: Types of documents

3.2 Descriptive view of the analysis

The study found 143 authors from 102 organizations and 23 countries who published their documents on library services during covid-19 in 28 sources. The 57 papers had 399 all keywords and 214 author keywords. In addition, 1429 cited references were found with 885 cited sources and 1981 cited authors (Table 2).

Item	Number
Total raw documents	64
Documents after filtration	57
Total Authors	143
Total sources	28
Total organizations	102
Total countries	23
Co-occurrence of all keywords	399
Co-occurrence of author keywords	214
Co-citation and cited reference	1429
Co-citation and cited source	885
Co-citation and cited author	1981

Table 2: Descriptive view of the study

3.3 Process of Analysis

Various bibliometric aspects of each document were investigated, including document type, citation counting, top-cited documents, document distribution worldwide, the most productive countries, institutions, journals, co-citation and bibliographic coupling. We exported all data into Microsoft Excel after finishing data extraction for statistical analysis and rating various bibliometric indicators, such as top-cited papers, top countries, organizations, and journals. To visualize the relationship between names, keywords, countries, and so on, we used the VOSviewer software. VOSviewer is application software that helps us create maps based on

network data and simulate and explore them. VOSviewer may create networks of scientific articles, journals, academics, research organizations, countries, keywords, and concepts. Co-authorship, co-occurrence, citation, bibliographic coupling, and co-citation connections can all be used to bind items in these networks. Web of Science, Scopus, PubMed, RIS, and Crossref JSON files can be used by this software. Network visualization, overlay visualization, and density visualization are all examples of visualization techniques. The zooming and scrolling interface enables a map to be viewed in great detail (Van Eck & Waltman, 2013).

4 Results and discussion

As discussed above, sixty-four (64) documents were retrieved by searching the Scopus database on 1 September 2021. The search term used in the extraction was (*digitallibrary AND services AND COVID-19*) restricting by keyword. Finally, after filtering 64 documents, we considered 57 papers. 48 (84.21%) was articles, and 3(5.26%) was review, conference paper 4(7.02%), and book chapter and notes are 1(1.75%) respectively (Table 1). The year 2021 occupied the most significant amount (39, 68.42%), while in 2020, it was 18(31.58%) of publications.

4.1 Top author in terms of citation

Rafiq, M., Batool, S. H., Ali, A. F., & Ullah, M. (2021) received a maximum of 20 citations from a single document. While Mehta, D. & Wang, X. (2020) earns ten citations with 2nd position and Koscieljew, M. (2021) ranked 3rd position with nine citations (Table 3).

Author	Title	Documents	Citations
Rafiq M.	Rafiq, M., Batool, S. H., Ali, A. F., & Ullah, M. (2021). University libraries response to COVID-19 pandemic: A developing country perspective. <i>The Journal of Academic Librarianship</i> , 47(1), 102280.	1	20
Mehta D.	Mehta, D. & Wang, X. (2020). COVID-19 and digital library services – a case study of a university library. <i>Digital Library Perspectives</i> , 36(4), 351-363.	1	10
Koscieljew M.	Koscieljew, M. (2021). The coronavirus pandemic, libraries and information: a thematic analysis of initial international responses to COVID-19. <i>Global Knowledge, Memory and Communication</i> , 70(4/5), 304-324	1	9

Table 3: Top author in terms of citation

The total number of authors identified through statistical analysis is 143. Almost all authors are engaged to work on library services during covid-19. The COVID-19 epidemic had a devastating impact on many sectors, including education, causing all academic institutions and libraries to

close for safety reasons. Scholarly groups have said that the consequences of this pandemic scenario are considerably more widespread than previously thought. On the other hand, this situation presented several opportunities and prompted demands for a digital transition (Rafiq, M. et al., 2021). In table 3, the top authors have been identified in terms of receiving citations in their documents. It is found that Rafiq, M., Batool, S. H., Ali, A. F., & Ullah, M. has achieved the highest citation (20) with one paper of university libraries response to COVID-19 pandemic: A developing country perspective. The paper COVID-19 and digital library services – a case study of a university library by Mehta, D. & Wang, X. received 10 citations, are in the second position. Koscielny earned the third-highest citation with 9 citations in the work of the coronavirus pandemic, libraries and information: a thematic analysis of initial international responses to COVID-19. Thus, the top papers are concerned with the library services during the catastrophic period of covid-19.

4.2 Top author in terms of documents publications

Table 4 identified the top authors in terms of document publication. It is found that Michalak R., Ortiz-Díaz E.M., Pacheco-Mendoza J., Rysavy M.D.T., Saavedra-Alamillas C. published 2 documents each. All of the authors worked and published the documents on the library's services towards their user's community, the techniques to reach the users during the pandemic.

Number of Documents and Authors
1. Michalak, R., & Rysavy, M. D. (2021). Keeping Library Staff Safe: Using Zoom TVs to Bridge the Gap Between In-Person and Virtual Service Consultations During COVID-19. <i>Journal of Library Administration</i> , 61(5), 588-596.
2. Rysavy, M. D., Michalak, R., & Daly, B. (2021). Library Marketing: Sending Text Messages and Emails to Online Library Users During COVID-19. <i>Journal of Library Administration</i> , 61(3), 358-365.
1. De los Ángeles Ortega-Martínez, E., Pacheco-Mendoza, J., Meléndez, H. E. G., Ortiz-Díaz, E. M., & Saavedra-Alamillas, C. (2021). Digital services adapted by libraries in Mexico to COVID-19 pandemic: a critical review. <i>Digital Library Perspectives</i> . 37(1), 3-17
2. Saavedra-Alamillas, C., Pacheco-Mendoza, J., García-Meléndez, H. E., López, A. V., Martínez-Camacho, H., Ortiz-Díaz, E. M., & Ortega-Martínez, E. (2020). Document delivering services: a strategy to support research in Mexican universities in the pandemic by COVID-19. <i>Digital Library Perspectives</i> . 36(4), 337-349

Table 4: Top author in terms of documents publications

4.3 Top countries in terms of published document

The entire country identified through statistical analysis is 23. According to table 5, the top 10 countries have been famous for publishing documents and receiving citations. It is found that the United States of America is at the top to publish the scholarly publication on the Library Services during the COVID-19 related documents with 21 documents. India is in the 2nd rank with eightpapers followed by Pakistan 4, China 4; Nigeria, Peru and South Korea have three documents each, while Canada, Spain and South Africa havetwopapers each. Likewise, in terms of citation (Table 6), The United States of America also achieved first place with 37 citations in 21 documents, followed by Pakistan 22 citations in 4 documents, followed by Malta (9/1), China (7/4), Canada (5/2), Nigeria (4/3), Spain (3/2), Sweden (3/1), Zimbabwe (3/1) and South Africa (2/2).

Id	Country	Documents	Citations
22	United States	21	37
7	India	8	1
14	Pakistan	4	22
5	China	4	7
13	Nigeria	3	4
15	Peru	3	0
19	South Korea	3	0
4	Canada	2	5
20	Spain	2	3
18	South Africa	2	2

Table 5: Country vs document publication

4.4 Top organization in terms of document publication

The entire organization identified through statistical analysis is 102. Table 6 displays the top ten universities connected to the recovered records, with authors from the director of Institutional Research & Training, Goldey-Beacom College, Wilmington, De, the United States; director of the Library, Archives, & Learning Center, Goldey-Beacom College, Wilmington, De, United States; Partner At Rysavy And Michalak Consultants, Wilmington, De, United States (Keeping Library Staff Safe: Using Zoom TVs to Bridge the Gap Between In-Person and Virtual Service Consultations During COVID-19 & Library Marketing: Sending Text Messages and Emails to Online Library Users During COVID-19); is in the top position with two documents. During covid-19, the library adapted user-friendly techniques to reach users. As of the top-ranked documents, the library has designed two new library marketing campaigns using the project management app, Notion. In the first campaign, the library emailed the community to increase

awareness and usage of the library’s eBook collections. The second campaign broadened the purpose of the marketing campaign to promote online resources and tools during covid-19 (Rysavy, Michalak, & Daly, 2021).

Id	Organization	Documents	Citations
29	Director of Institutional Research & Training, Goldey-Beacom College, Wilmington, De, United States	2	0
30	Director of the Library, Archives, & Learning Center, Goldey-Beacom College, Wilmington, De, United States	2	0
67	Partner At Rysavy And Michalak Consultants, Wilmington, De, United States	2	0
3	Central Library, National University Of Sciences And Technology (Nust), Sector H-12, Islamabad, Pakistan	1	20
10	Department Of Information Management, Quaid-E-Azam Campus, University Of The Punjab, Lahore, Pakistan	1	20
50	Kulliyat-UI-Banat Degree College, Lahore, Pakistan	1	20
7	Department Of Digital Library Services, Bridgewater State University, Bridgewater, Ma, United States	1	10
22	Department Of Reference Services, Bridgewater State University, Bridgewater, Ma, United States	1	10
59	Lucy Home, Bridgewater, United States	1	10
18	Department Of Library Information And Archive Sciences, University Of Malta, Msida, Malta	1	9

Table 6: Top organization in terms of document publication

The article by Department of Information Management, Quaid-e-Azam Campus, University of the Punjab, Lahore, Pakistan; Kulliyat-ul-Banat Degree College, Lahore, Pakistan; Central Library, National University of Sciences and Technology (NUST), Sector H-12, Islamabad, Pakistan “University libraries response to COVID-19 pandemic: A developing country perspective” received top citation 20 (Table 7).

Id	Organization	Documents	Citations
3	Central Library, National University of Sciences and Technology (Nust), Sector H-12, Islamabad, Pakistan	1	20
10	Department of Information Management, Quaid-E-Azam Campus, University of The Punjab, Lahore, Pakistan	1	20
50	Kulliyat-UI-Banat Degree College, Lahore, Pakistan	1	20
7	Department of Digital Library Services, Bridgewater State University, Bridgewater, Ma, United States	1	10
22	Department of Reference Services, Bridgewater State University, Bridgewater, Ma, United States	1	10
59	Lucy Home, Bridgewater, United States	1	10
18	Department of Library Information and Archive Sciences, University of Malta, Msida, Malta	1	9
9	Department of Information and Library Science, Southern Connecticut State University, New Haven, Ct, United States	1	7

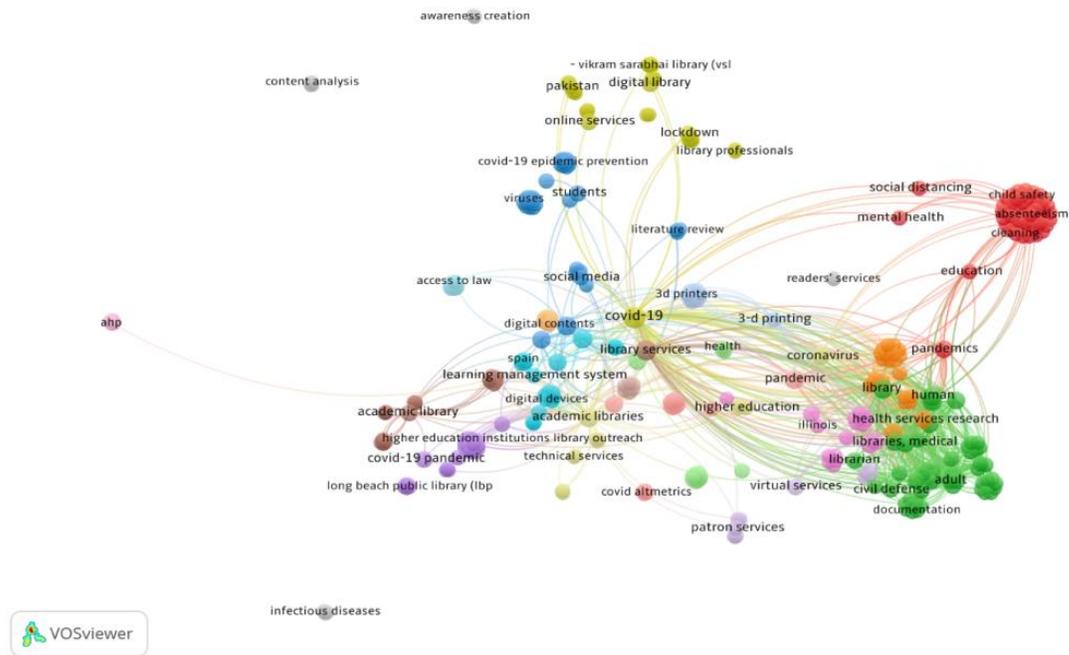


Figure 3: All keyword visualization map

4.7 Author Co-citation and cited author, sources, cited reference, bibliographic coupling

When two documents both cite the same third document, this is referred to as bibliographic coupling. Keep in mind that the figure only includes the first two related papers; the third document does not appear in the figure unless it too has a significant degree of bibliographic coupling through other publications. When two articles are cited by a third document that has been published, this is referred to as co-citation. It should be noted that the figure depicts the two papers that are the subject of the reference but not the third document that cites the other two. In this way, the highest production in the journal is represented by bibliographic coupling, which also shows how this study is related. Furthermore, co-citations display the most frequently referenced research in the publication and its relationships (Merigó et al., 2016). In the case of co-citation of the cited author, it is seen that Featherstone, R.M., Ali, M.Y., Gatti, P. is in the core (figure 4).

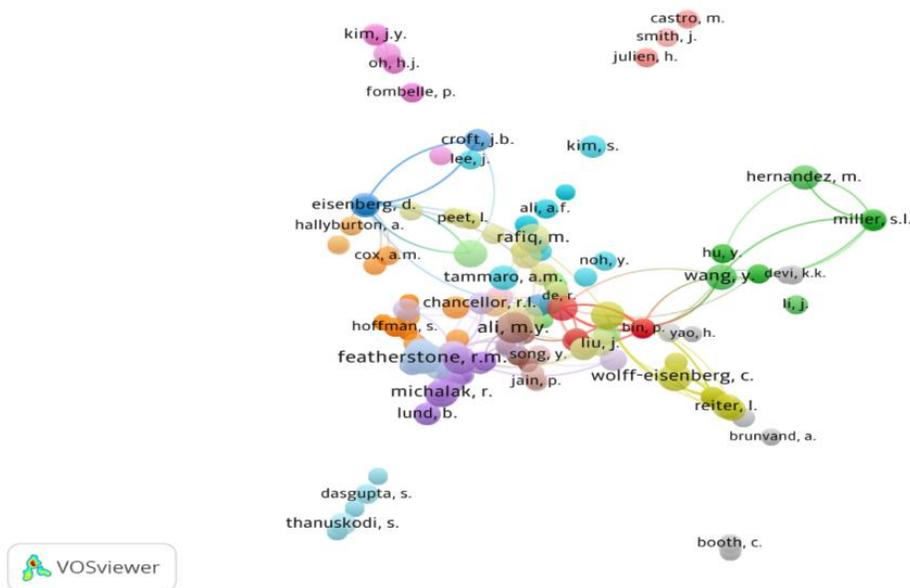


Figure 4: co-citation and cited author

Rafik, M (2021) is in the centre of the graph with the article “university libraries response to COVID-19 pandemic:A developing country perspective” that has been published in *The Journal of Academic Librarianship*(bibliographic coupling -figure 6). In the case of co-citation and cited sources, the Journal of Academic Librarianship is at the core of the graph (Figure 5).

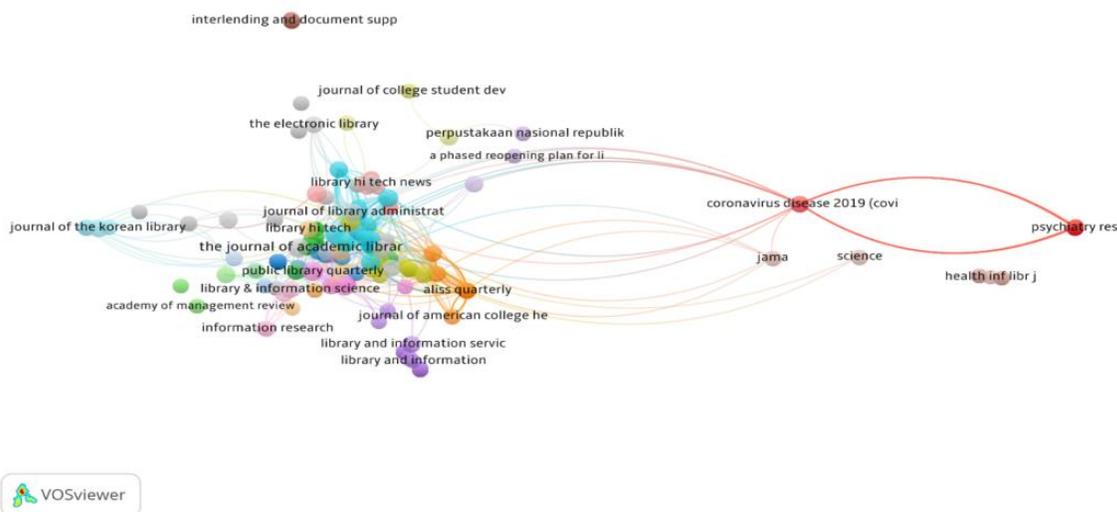


Figure 5: Co-citation and sources visualization map

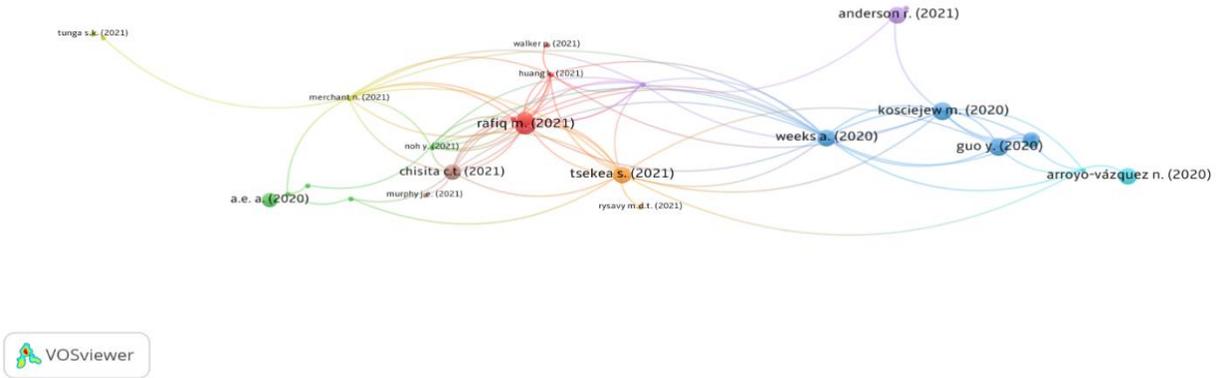


Figure 6: Bibliographic coupling visualization map.

5 Conclusions

64 documents appeared while searched through digital library services and covid-19 in Scopus database by digital library AND services AND COVID-19). Finally, after filtering 64 documents, the study considered 57 papers. During the epidemic, nearly 90% of publications were related to digital libraries, while just 11% were scientific journal articles, according to the findings. Rafiq, M., Batool, S. H., Ali, A. F., &Ullah, M. were found influential authors who published university libraries response to COVID-19 pandemic: A developing country perspective in *The Journal of Academic Librarianship* in 2021. With 21 documents, the United States of America is rated first in publishing scholarly publications on Library Services during the COVID-19 related materials. With eight papers, India is ranked second, followed by Pakistan, China, Nigeria, Peru, and South Korea. The most common keyword retrieved from this study is COVID-19 (n=48 repeats), library services (n=18 repeats), digital libraries (n=11 repeats). Due to a lack of ties connecting individual writers, academic articles have proven ineffectual as a means of communication. As a result, there's a good chance that articles on this subject will appear. More than merely raising librarians and library visitors, the change to enhanced virtual and digital services is a bid to keep the library relevant in a tech-centered culture. The publishing trend in any subject of research may be examined using the trend of authors. The study's major goal was to provide a paradigm for new researchers to learn about influential publications, authors,

institutions, and nations. The current results reveal favorable and consistent digital library research output during the Covid-19 epidemic, as well as how libraries deal with the ongoing issues of providing remote library access to their customers. In light of the findings, libraries should consider upgrading their resources to include better digital technology to meet the increased demand for knowledge and information during the pandemic.

Future Research Direction

Further research can focus on the systematic literature review on digital library and covid-19 related papers. Systematic reviews are a novel approach in international development research that has the potential to improve and promote evidence-based policymaking, especially in areas where the evidence base is robust and well-developed. When the concepts of systematic reviews are applied with care, systematic reviews provide a distinct advantage above standard literature reviews (Mallett et al., 2012). Moreover, bibliographic coupling and citation analysis may be conducted further.

Limitation of Research

The study covers only Scopus database. There are other databases in the internet. If other database were included, it could have been sought more articles. In addition, the search did not consider title, abstract and keyword search. On January 26, 2022, the search by title, abstract and keyword (TITLE-ABS-KEY (*library* AND *services* AND (*covid 19* OR *coronavirus* OR *2019-ncov* OR *sars-cov-2* OR *cov-19*) retrieved 432 documents. The author considered only the articles that focused only the services of library during covid-19 in the article title. In addition, the citation analysis is strong with more than three years back publication. This article has considered the articles only published from 2020 to 2021 as the pandemic has been started since the end of 2019. Because of the Coronavirus 2019 (COVID-19) pandemic, the worldwide education system has been faced with unprecedented obstacles.

Most nations stopped educational institutions for a period of time in an effort to slow the spread of the virus and limit the number of illnesses (Crawford et al., 2020; UNESCO, 2020; Tria, 2020). Library and information professionals have been changing the face to face services to virtual library services from the time of lockdown announced in different countries of the world. Thus, it was not possible to consider the articles that did not deal with covid-19 and library services.

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Appendices

List of Articles (57 articles) for this bibliometric study

Authors	Title	Year	Source title
Adams A., Hackstadt A.	Distrust in Institutions: Reference and Library Instruction during an Infodemic	2021	ACM International Conference Proceeding Series
Bladek M.	Student well-being matters: Academic library support for the whole student	2021	Journal of Academic Librarianship
Peruginelli G., Conti S., Fioravanti C.	COVID-19 and digital library services: an overview on legal information	2021	Digital Library Perspectives
Ortega-Martínez E.Á., Pacheco-Mendoza J., GarcíaMeléndez H.E., Ortiz-Díaz E.M., Saavedra-Alamillas C.	Digital services adapted by libraries in Mexico to COVID-19 pandemic: a critical review	2021	Digital Library Perspectives
Tsekea S., Chigwada J.P.	COVID-19: strategies for positioning the university library in support of e-learning	2021	Digital Library Perspectives
Winata A.P., Fadelina R., Basuki S.	New normal and library services in Indonesia: a case study of university libraries	2021	Digital Library Perspectives
Mbambo-Thata B.	Responding to COVID-19 in an African university: the case the National University of Lesotho library	2021	Digital Library Perspectives
Tunga S.K.	Covid-19 And Web-Based Services: A Content Analysis Of Library Associations' Webpages Of India	2021	Library Philosophy and Practice
Murphy J.E., Lewis C.J., McKillop C.A., Stoeckle M.	Expanding digital academic library and archive services at the University of Calgary in response to the COVID-19 pandemic	2021	IFLA Journal
Noh Y.	A study on researcher use behavior changes since Covid-19	2021	Journal of Librarianship and Information Science
Wilson M.	Australian Public Library Staff Living through a Pandemic: Personal Experience of Serving the Community	2021	Journal of the Australian Library and Information Association
Huang K., Hao X., Guo M., Deng J., Li L.	A study of Chinese college students' COVID-19-related information needs and seeking behavior	2021	Aslib Journal of Information Management
Mashiyane D., Molepo M.	Curbside book pick-up services during a time of crisis in South African University Libraries	2021	Library Philosophy and Practice
Asimah A.P.A., Dzogbede O.E., Akaba S.	Digital Library Usage During The Covid-19 Pandemic	2021	Library Philosophy and Practice
Nageswari N., Thanuskodi S.	Usage of Public Library Services in Long Beach City, California-USA during Covid-19 Pandemic: An Analysis	2021	International Journal of Information Science and Management
Jana A., Rout R.	Preparedness of the libraries to address the recent pandemic: A case study on 100 top academic institutes of India	2021	DESIDOC Journal of Library and Information Technology
Michalak R., Rysavy M.D.T.	Keeping Library Staff Safe: Using Zoom TVs to Bridge the Gap Between In-Person and Virtual Service Consultations During COVID-19	2021	Journal of Library Administration
Merchant N., Ahmed F.	COVID-19 and Pakistani academic libraries: documenting the realities, challenges and state of services	2021	Library Philosophy and Practice
Abraham P., Mohanan N.	Efficacy of Social Networking Sites in Library services at the Time of Social Distancing Due to Covid- 19 Lockdown: A Study Among the Library professionals and Students in India	2021	Library Philosophy and Practice
Meng Y., Dong L., Guan R., Zhang Y.	An analysis of university students' health information service needs from academic library in the post-COVID-19 age through Kano model	2021	Library Hi Tech
Balasubrahmanyam R., Singh A.K.	Performance Of Vikram Sarabhai Library, IIM Ahmedabad At The Covid-19 Pandemic Period: An Analytical Study	2021	Library Philosophy and Practice
Shastri D.K., Chudasma P.	The perception of ICT skills and challenges of usage of technologies among the library professionals of the Gujarat State during the COVID 19: a comprehensive study	2021	Quality and Quantity
Wilairat S., Svoboda E., Piper C.	Practical Changes in Reference Services: A Case Study	2021	Medical Reference Services Quarterly
Li D., Lin E.Z., Brault M.A., Paquette J., Vermund S.H., Godri Pollitt K.J.	Reopening Schools After a Novel Coronavirus Surge	2021	Advances in Experimental Medicine and Biology
Kim Y.S., Bae K.M., Kim S.Y., Park M.S.	Technology-driven Service Innovation in University Libraries	2021	Proceedings - 2021 21st ACIS International Semi-Virtual Winter Conference on Software

			Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing, SNPD-Winter 2021
Rysavy M.D.T., Michalak R., Daly B.	Library Marketing: Sending Text Messages and Emails to Online Library Users During COVID-19	2021	Journal of Library Administration
Abubakar M.K.	Implementation and Use of Virtual Reference Services in Academic Libraries during and post COVID-19 Pandemic: A Necessity for Developing Countries	2021	Library Philosophy and Practice
Chisita C.T., Chizoma U.S.	Rethinking academic library space amidst the COVID-19 pandemic in South Africa: preparing for the future	2021	Information Discovery and Delivery
Kim J.H., Jeong S.B., Lee K.J., Gim G.Y.	A Study on Factors Affecting the Intention to Use Library Information System	2021	Studies in Computational Intelligence
Callaway J.	The Librarian Reserve Corps: An Emergency Response	2021	Medical Reference Services Quarterly
Lindsay J.M., Petersen D., Gabeel K.L., Quesenberry A.C., Pujol A., Earl M.	Mind like Water: Flexibly Adapting to Serve Patrons in the Era of COVID-19	2021	Medical Reference Services Quarterly
Sullo E., Brody S.	Providing Information to Support COVID-19 Pandemic Response: Academic Medical Librarians' Roles in Creating an Intelligence Report	2021	Medical Reference Services Quarterly
Howes L., Ferrell L., Pettys G., Roloff A.	Adapting to Remote Library Services during COVID-19	2021	Medical Reference Services Quarterly
Koos J.A., Scheinfeld L., Larson C.	Pandemic-Proofing Your Library: Disaster Response and Lessons Learned from COVID-19	2021	Medical Reference Services Quarterly
Clifton V.L., Flathers K.M., Brigham T.J.	COVID-19–Background and Health Sciences Library Response during the First Months of the Pandemic	2021	Medical Reference Services Quarterly
Walker P.	The library's role in countering infodemics	2021	Journal of the Medical Library Association
Haugh D.	Communicating with medical library users during COVID-19	2021	Journal of the Medical Library Association
Anderson R., Fisher K., Walker J.	Library consultations and a global pandemic: An analysis of consultation difficulty during COVID-19 across multiple factors	2021	Journal of Academic Librarianship
Rafiq M., Batool S.H., Ali A.F., Ullah M.	University libraries response to COVID-19 pandemic: A developing country perspective	2021	Journal of Academic Librarianship
Temiz S., Salelkar L.P.	Innovation during crisis: exploring reaction of Swedish university libraries to COVID-19	2020	Digital Library Perspectives
Saavedra-Alamillas C., Pacheco-Mendoza J., García-Meléndez H.E., VilchisLópez A., Martínez-Camacho H., Ortiz-Díaz E.M., Ortega-Martínez E.	Document delivering services: a strategy to support research in Mexican universities in the pandemic by COVID-19	2020	Digital Library Perspectives
Mehta D., Wang X.	COVID-19 and digital library services – a case study of a university library	2020	Digital Library Perspectives
Weeks A., Houk K.M., Nugent R.L., Corn M., Lackey M.	UNLV Health Sciences Library's Initial Response to the COVID-19 Pandemic: How a Versatile Environment, Online Technologies, and Liaison Expertise Prepared Library Faculty in Supporting Its User Communities	2020	Medical Reference Services Quarterly
Ali M.Y., Naem S.B., Bhatti R.	Digital Technologies Applications in the Provision of Library and Information Services in Health Crises	2020	Journal of Hospital Librarianship
Quispe-Farfán G.A.	Peruvian public libraries in the face of the COVID-19 crisis: Services, reflections and challenges [Las bibliotecas públicas peruanas frente a la crisis de la COVID-19: servicios, reflexiones y desafíos]	2020	Revista Interamericana de Bibliotecología
Wu A.	Online data literacy services during the covid-19 epidemic prevention taking peking university library as an example	2020	Proceedings of the ACM/IEEE Joint Conference on Digital Libraries
Craft A.R.	Remote Work in Library Technical Services: Connecting Historical Perspectives to Realities of the Developing COVID-19 Pandemic	2020	Serials Review
Walsh B., Rana H.	Continuity of academic library services during the pandemic: The university of toronto libraries' response	2020	Journal of Scholarly Publishing
Hepperger A., Gstöttenmeier E.	"As I cannot come to the university, how can I get the book, that I really need right away...". opportunities for a university library (FH) to efficiently meet user requests in times of the COVID-19 crisis ["Ich kann nicht an die FH kommen und brauche das	2020	VOEB-Mitteilungen

	wirklich ganzdringend ...". möglichkeiteneinerfachhochschulbibliothekeffizientbenutzer*inn enwünsche in zeiten der COVID-19-krise zuerfüllen]		
Neog S.	Library services through Social Media during lockdown due to COVID-19 with special reference to University Libraries of Assam	2020	Library Philosophy and Practice
Sumi S., Kumar J.	Research support services of Panjab University library during lockdown period due to COVID-19: A survey	2020	Library Philosophy and Practice
Ishtiaq S., Sehar N., Shahid A.	Information Dissemination during Covid-19 and Lockdown: The Role of University libraries of Sindh, Pakistan	2020	Library Philosophy and Practice
A.E. A., J.A. A., D.F. A., D. A I.	Sensitization and Awareness Creation as Tools for Curbing Perceived Effects of COVID-19 Pandemic on University Library Users in Nigeria	2020	Library Philosophy and Practice
D'Amico P.B.	COVID-19 at Biblioteca Utopía, Buenos Aires, Argentina	2020	International Information and Library Review
Arroyo-Vázquez N., Gómez-Hernández J.-A.	Integrating libraries into online university learning: The current situation in Spain [La biblioteca integrada en la enseñanza universitaria online: Situación en España]	2020	Profesional de la Información
Kosciejew M.	The coronavirus pandemic, libraries and information: a thematic analysis of initial international responses to COVID-19	2020	Global Knowledge, Memory and Communication
Guo Y., Yang Z., Yang Z., Liu Y.Q., Bielefeld A., Tharp G.	The provision of patron services in Chinese academic libraries responding to the COVID-19 pandemic	2020	Library Hi Tech