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ORIGINAL ARTICLE

A Review and Bibliometric Analysis of Impact of COVID 19 on Patients and Hospitals

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Abstract

Background: Since COVID19 outbreaks, hospitals are drastically impacted worldwide. The majority of hospitals postponed their nonemergency care which creates consequences for the people who are in dire need of medical services. The healthcare system is struggling to cope with the pandemic situation. As the healthcare infrastructure of India is not very vast and resources are also limited to release out pressure created by pandemic on healthcare institutions. Based on government regulations, many hospitals are dedicatedly converted to COVID19specific centers due to which outpatient department patients faced great difficulties and also impacted the revenue generation of hospitals. **Objective:** To deeply understand the impact of COVID19 on hospitals and patients. **Methods:** This study investigates the impact of COVID-19 on healthcare systems and patients by searching relevant data from 2020 to 2021 using keywords related to pandemic effects. It selects reliable research articles, assesses their quality, and extracts data from 680 papers using bibliometric analysis. Data collection is focused on English-language publications from the Scopus database, emphasizing theoretical and empirical journals on COVID-19's impact on patients and hospitals. **Results and Conclusion:** Every possible step should be made to minimize the loss like patients who don't require any hospital treatments can be care at home only critical patient (who has need of ventilations, blood pressure support) should be care at hospitals which can be minimize the burden on hospitals.

Keywords: COVID19, healthcare professionals, hospitals, India, lockdown, patients

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Introduction

The COVID19, a pandemic disease which spread worldwide in 2019 (the first coronavirus found in 2019, in Wuhan China). COVID19 affects all services drastically be its entertainment industry, hospitality, or health care. The COVID19 drastically changes the procedure of availing healthcare services. It changes all practices as we all follow in normal life. Initially, the China hospitals get affected by this pandemic disease later worldwide all hospitals facing the same problem.

In hospitals all over the management affected by this COVID19, every hospital service time affected, revenue, funding, management, policies, capacity, and infrastructure become changed. Many hospitals delay their nonemergency care, due to this patient gets affected by not getting health services on time and hospitals get affected by the immense pressure and inadequate healthcare infrastructure. This situation can be handled in the cities but the major problem was the lowincome country where health and social systems are already weak, lack of sexual and healthcare services causes maternal mortality and morbidity.

General impact of COVID19 on hospitals is it increases the working hour of frontline workers such as longer shifts and no off from work. Media also stated that due to lesser number of nurses, each nurse has to be taken care of more patients. Hence, there is more exhaustion of nurses. Surgeries were cancelled and orthopedics would be the most affected section as during orthopedic surgery; there is high risk of spread of virus. There is no space in the hospitals for the patients, one room is occupied by lots of patients. Free spaces are also converted into rooms so infrastructure also gets affected. Physical distancing, quarantine, and isolation can cause worst loneliness, mental health symptoms, withdrawal symptoms, and psychological trauma. Women and young people face the greatest risk of depression and anxiety.

Literature Review

Dwivedi *et al*. [1] have assessed the nationwide lockdown impact on COVID19 infections and the burden on health facilities. The exponential growth model was implemented to predict future cases and to examine the burden on the healthcare system in tackling COVID19 in India. Due to the nationwide lockdown, the number

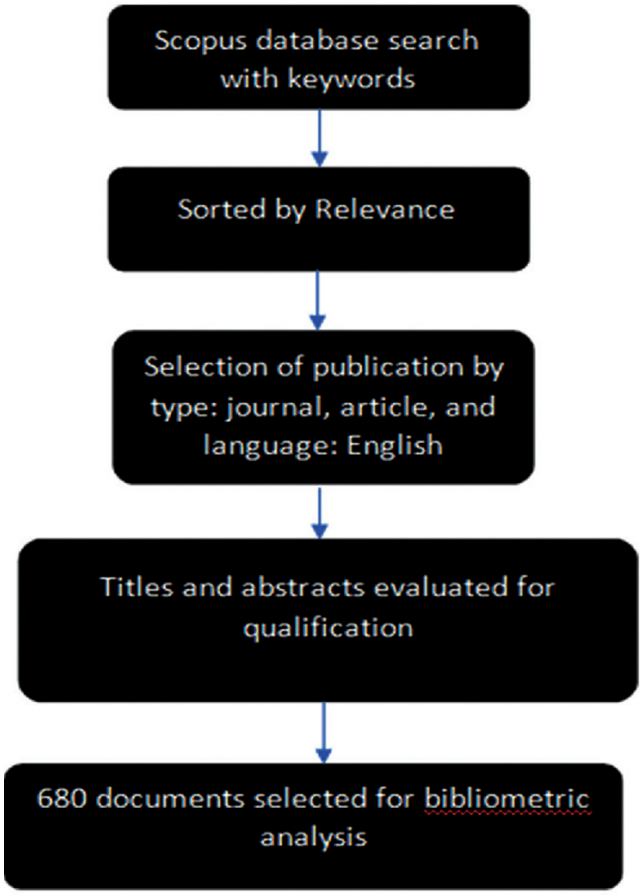


Figure 1: Systematic process to select literature

of COVID19confirmed cases reduced in India. However, a significant pressure was observed on the healthcare system due to its overstretched nature in India. As the number of healthcare professionals is relatively low which are unable to cater the population of India.

Dalal [2] has explained about the social issues experienced by cancer patients during the COVID19 pandemic. Fear is one of the most hyped social issues that people go through during lockdown and pandemic and it is associated with various psychological problems such as depression, anxiety, stress, and negative thoughts. There are also other concerns raised during the pandemic which aggravated the situation for cancer patients and their families which include financial burden, transportation, accommodation, and proper treatment. As hospitals are already flooded with patients who are suspected to be COVID positive, hospitals are only considering those cases who are critical and need emergency treatment. Hence, it becomes difficult for patients to avail medical guidance who recently discovered about having cancer.

Hebbar *et al*. [3] have explained about the impact of COVID19 on healthcare delivery in India. Patients with other medical conditions than COVID are not able to avail medical treatment on priority. As healthcare providers are warming up to tackle the pandemic situation. Several moral and ethical dilemmas raised up during the pandemic situation which needs to be resolved by implementing potential solutions such as usage of teleconsultations to provide support to patients, improvement of healthcare facilities to manage critical and emergency patients who require immediate care and delivery of medicines on doorstep.

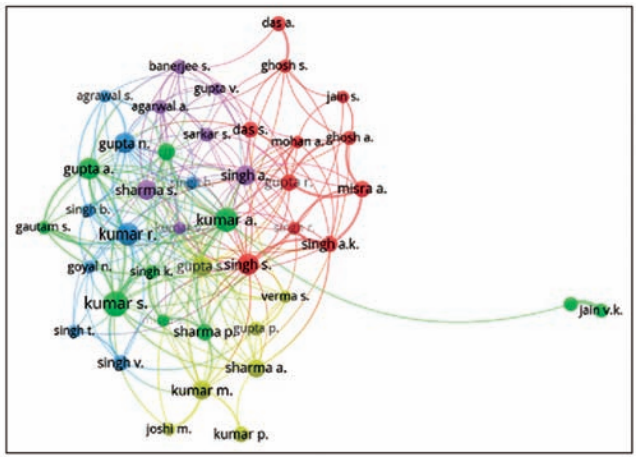


Image 1: Co-authorship Map

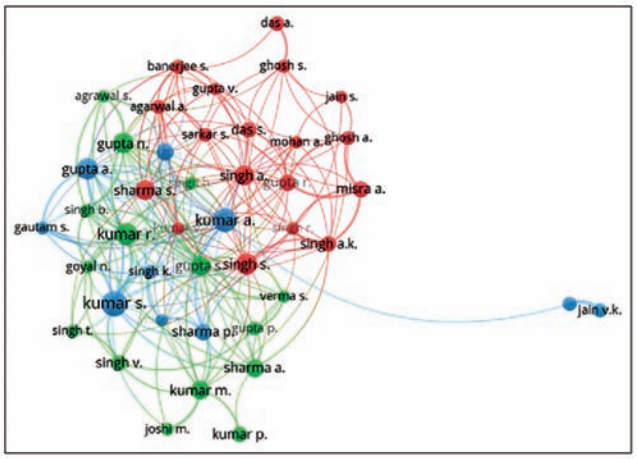


Image 2: Co-authorship Map (Network map using bibliographic data)

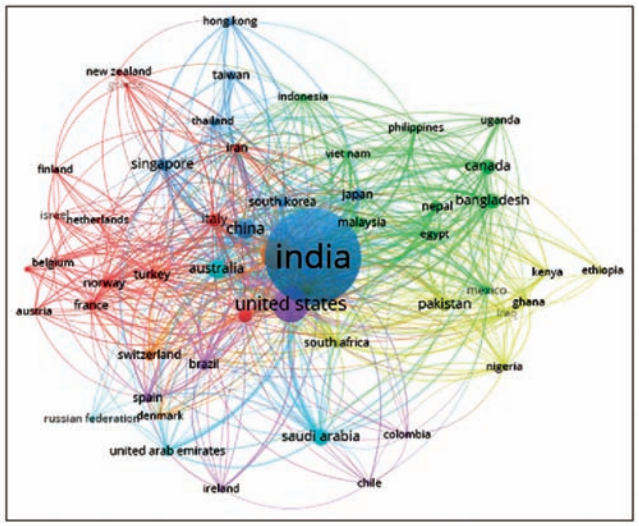


Image 3: Co-authorship Map of Countries

Bhambere *et al*. [4] have analyzed the rapid infusion of technology in healthcare sector to cope with the pandemic situation. The healthcare system at the time of lockdown and initial phase of COVID19 was not ready to manage the situation raised by pandemic but with time and adaptation of new technology, healthcare system improves and learned to get along with the situation. COVID19 shows mirror to world health system where they stand and how much they have to grow to manage a pandemic like this.

Sze *et al*. [5] have explained about the need for improved discharge criteria for patients of COVID19 to avoid longterm implications. Based on the severity of the effects of severe acute respiratory syndrome coronavirus 2 (SARSCoV2), proper procedure must be followed before discharging any patient. As this strain is asymptomatic, higher risk is involved in this. Patients must follow the quarantine period and cannot be discharged based on their own discretion. Current study suggests that this strain loses its infectivity after 10–14 days when symptoms are not visible.

Haji *et al*. [6] have explored about the usage of Personal Protective Equipment's (PPE) kits by healthcare workers in intensive care units during COVID19. Survey was conducted to understand the awareness of PPE kits and their usage and disposal among healthcare workers. And who all undergo training for the donning and doffing of PPE kits as it is very crucial to safeguard and avoid the risk of infection in healthcare workers. This survey was conducted during two phases and the difference between these two phases is of 2 weeks. In the first phase, the training for PPE among healthcare workers is suboptimal, and in the second phase, it gradually improves.

Research Question

1. Which are the top contributing Authors, Organizations, and countries for the research on impact of COVID19 on patients and hospitals?
2. Which countries collaborated the most in writing papers on the impact of COVID19 on patients and hospitals?
3. Which is the most influential journal in which authors publish articles on impact of COVID19 on patients and hospitals?
4. Which is the most used keyword in articles of the impact of COVID19 on patients and hospitals?
5. Which is the current theme in which researchers give utmost importance while writing papers on impact of COVID19 on patients and hospitals?
6. What is the past trend for impact of COVID19 on patients and hospital research?

Methodology

The study is conducted to represent and determine the factors through relevant data which impact the healthcare system and patients during COVID19 and summarized it. It comprises the following stages:

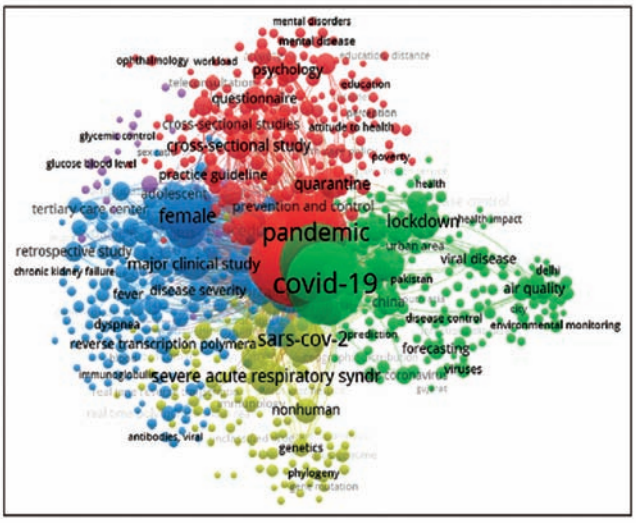


Image 4: Words Co-occurrence map

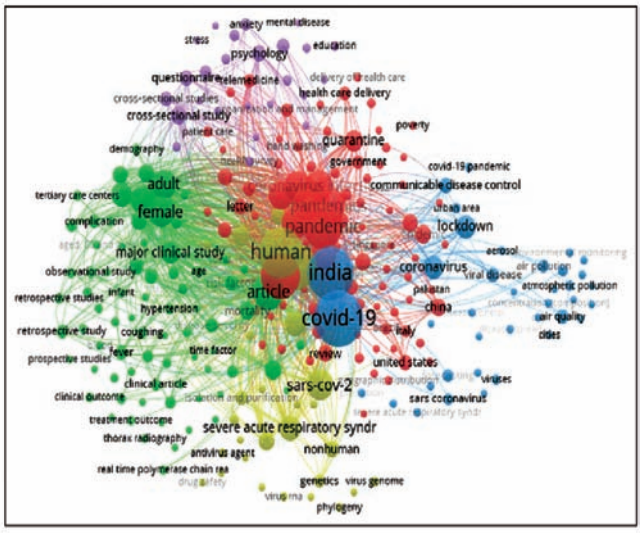


Image 5: Keywords Co-occurance map

Strategy

Search of relevant data using keywords such as "Impact of COVID19 on hospitals and patients" "Effect of COVID19 pandemic and lockdown on healthcare system," and "Issues faced by healthcare institutions during COVID19."

Selection Criteria

As this is a recent topic, which comes into research from 2020. Hence, there are not many studies by authors on this topic. Hence, we included publications and research articles which are published in 2020 and 2021. This study includes research articles which are published just after the spread of COVID19 pandemic and till now in 2021. Which are based on the difficulties and issues faced by healthcare institutions and patients during COVID19.

Quality Assessment

Reliable research article, publications, and conference papers are used for this study. And to maintain the quality of data, duplication or collection of facts from unreliable sources was completely avoided. During the review process, data of the research paper is carefully examined to maintain its quality and educational relevance. Papers which are only in the English language are considered for reference. 680 papers were selected which are based on impact of COVID19 on the healthcare system and patients.

Data Extraction

Based on the stated criteria, 680 research papers were shortlisted to proceed for the final analysis from Scopus on the impact of COVID19 on the healthcare system. Because of the high frequency of data, manual analysis is cumbersome. Due to which, with the help of "VoS viewer" software bibliometric research was conducted on 680 studies.

Bibliometric analysis is one of the most common and recommended methods for data analysis. In this study, graphical mapping of bibliometric information was using VOS viewer program by employing various indicators such as co-authorship of authors, co-authorship of countries, co-authorship of organizations, cooccurrence of keywords, citation of documents, and so on. Figure

1 shows explains about the systematic process to select literature.

Data Collection

In this study, the collection of data is done from the Scopus database. It includes indexes that cover wide range of peerreviewed articles, it delivers accurate bibliographic information. All results are limited to English language publications and journals. The more focus is to choose theoretical and empirical journals on the application of impact of COVID19 on patients and hospitals. This consoled the research that employed impact of COVID19 on patients and hospitals.

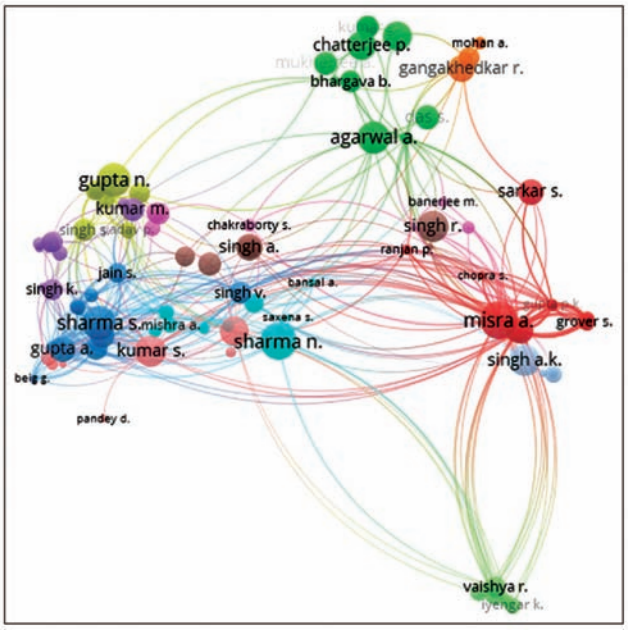


Image 6: Network map of citations by authors

Results and Discussion

Network map using bibliography data

Co-authorship map

Co-authorship map of authors

To identify the number of citations and documents published by different authors we use network map by VOS viewer to identify it [Image 1]. Hence, we used bibliometric analysis of the co-authorship of authors in the literature of COVID 19 and hospital management using fullcounting method, i.e., taking one author as one unit.

In the above network map, five clusters are formed (red, green, yellow, blue, and purple) with 215 links and 363 total link strengths.

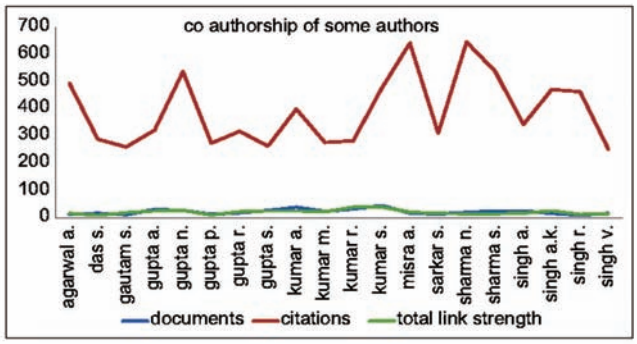
Every cluster has a minimum of seven items.

Graph 1 shows the comparison between these 20 authors on the basis of documents, citations, and total link strength.

On the basis of number of citations

MISRA A. and SHARMA N have the highest number of citations, i.e., 642 and 649, respectively.

On the basis of number of documents KUMAR S. has the highest number of published documents, i.e., 45 with 19 links with other authors and 41 total link strength.



Graph 1: Co-authorship of authors

By increasing the minimum cluster size to 8. We will get three clusters (red, blue, and green) [Image 2].

Co-authorship map of organizations

Seventyfour organizations in the network map are not connected to each other.

The most extensive set of connection between the organizations consist of 16 organizations. Hence, these 16 organizations are divided into five clusters (red, green, yellow, blue, and purple) with 22 links and 30 total link strengths.

Graph 2 shows the comparison between these 16 organizations on the basis of documents, citations, and total link strength.

On the basis of documents published Division of epidemiology and communicable diseases, Indian Council of Medical Research, New Delhi, has the highest number of documents that are published, i.e., nine with one link with another organization and one total link strength. In contrast, the All-India Institution of Medical Sciences, New Delhi, has published eight documents with three links with other organizations and four total link strengths.

On the basis of citations, the Centre for Chronic Diseases Control, New Delhi, has the highest number of citations, i.e., 135.

Co-authorship map of countries

We set a criterion to filter the data. Here, we took the minimum number of documents by a country to be five which is the default criteria in the VOS viewer software, and totally 197 countries have participated in the publication of the COVID19 and hospital management papers, out of which 53 meet the thresholds limit.

The network map [Image 3] shows 53 countries with their correlation with each other in the literature of COVID 19 and hospital management

Graph 3 shows various comparisons of different countries, i.e., the United States, United Kingdom, Saudi Arabia, Pakistan, Italy, India, China, Canada, Bangladesh, and Australia

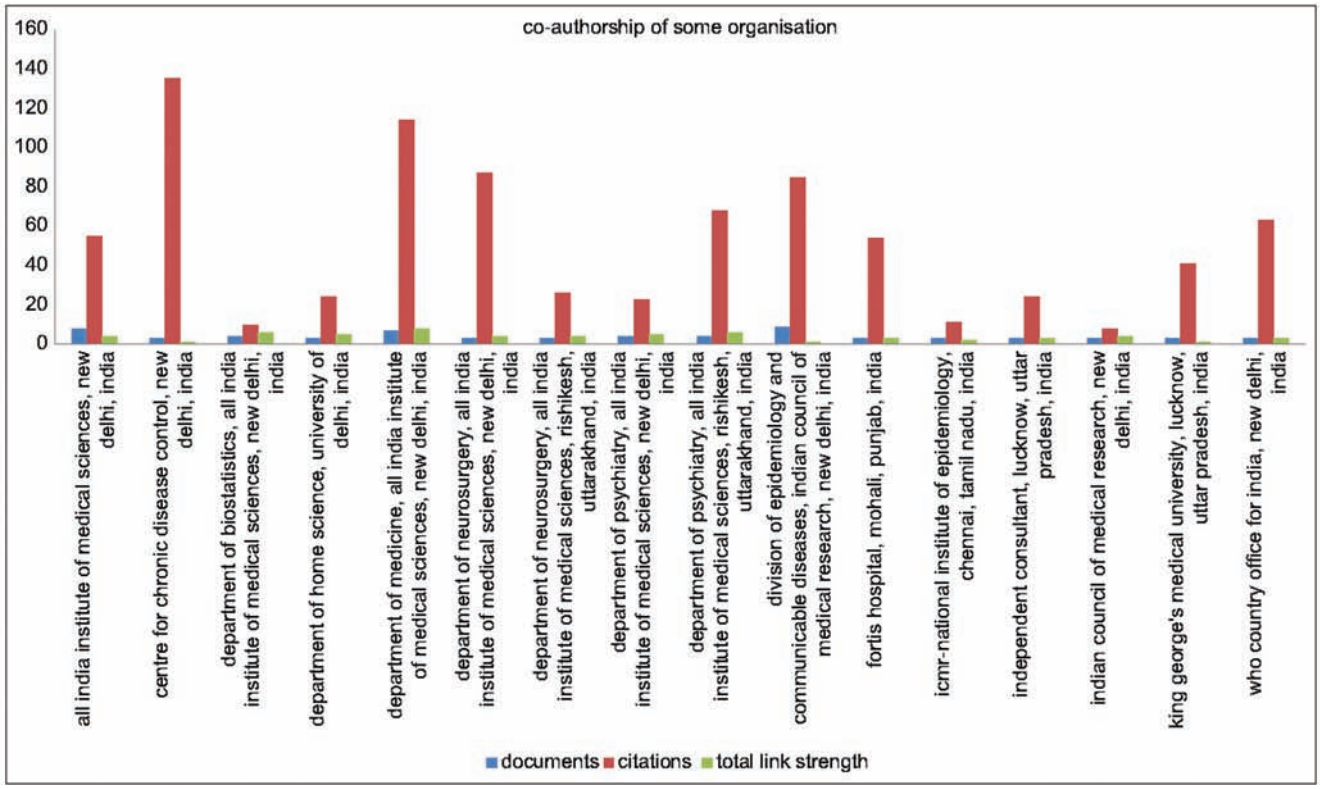
It shows that maximum documents published and citations are from India.

The number of collaborators with India is 51, and the total link strength is 709 with 1584 documents published by India and 16,841 citations.

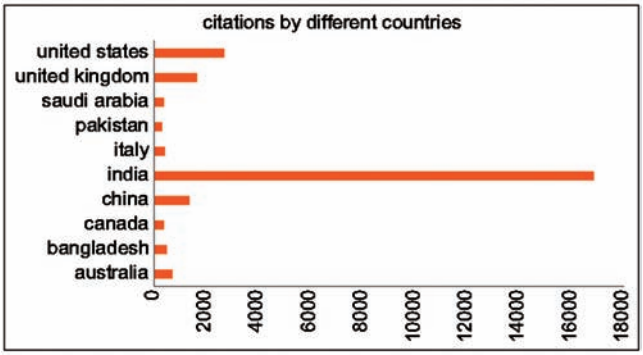
We can also spread the network map for analysis.

This can be done by changing the Attraction to 9 and Repulsion to 5 repulsions and attraction are the parameters that influence a country's location on the map.

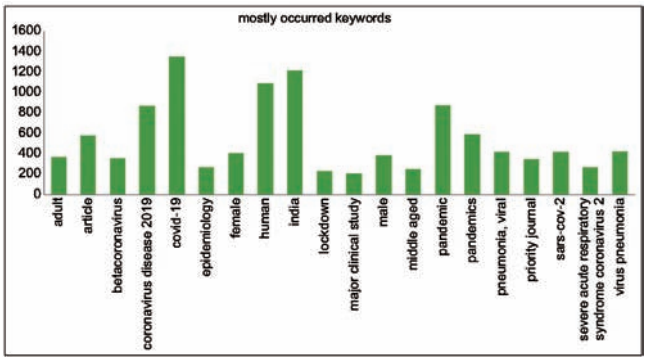
- (Default being 2 and 1, respectively)
- (Repulsion should be less than Attraction)
- "9 < Attraction <10



Graph 2: Co-authorship of organisations



Graph 3: Citation by different countries

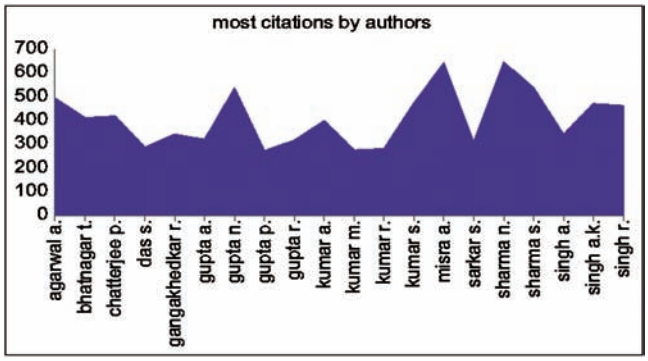


Graph 4: Most frequent occurred keywords

- "10 < Repulsion <9.

Cooccurrence map

To identify keywords used in various papers we use the network map by VOS-VIEWER to identify it [Image 4]. The author's keyword is analyzed as 1 unit by the help of fullcounting technique.



Graph 5: Most Citation by Authors

Therefore, we set a criterion by taking the minimum number of occurrences of a keyword to be 10. Out of 11,306 keywords, 705 meet the threshold limit. However, 705 words in a map will make it challenging to analyze. Comparing different keywords will be a difficult task so we increase the criteria, i.e., the minimum number of occurrences of a keyword to be 25, 256 meets the threshold.

Map displayed [Image 5] show us the most frequently used keywords by the authors which have been utilized in the literature on COVID19 and hospital management. Graph 4 shows a clear view of the frequently occurred word in the literature.

Following 20 words are frequently used, i.e., adult, article, beta coronavirus, coronavirus disease2019, COVID19, epidemiology, female, human, India, lockdown, major clinical study, male, middle aged, pandemic, pneumonia viral, priority journal, SARSCoV2, SARS, and virus.

Human, India, COVID19, pandemic, and coronavirus diseases2019 have the same link, i.e., 255 but have different nodes because of

their occurrence, which are 1093, 1215, 1350, 874, and 869, respectively. The most used word is INDIA.

In this map, pandemic and pandemics are treated as two different words. For this, we will remove pandemics as a keyword.

Citation by author's map

We set a criterion to filter the data. Here, we took the minimum number of citations by an author to be 5 which is the default criteria in the VOS viewer software, and only 194 authors cleared the threshold limit out of authors [Image 6].

But out of these 194 authors, only 114 authors are connected with each other. Hence, on the map, we will find 114 authors.

The above map shows the network between different 114 authors based on citations in COVID19 and hospital management literature.

Graph 5 shows the maximum citations by different authors.

These 22 authors, i.e., Agrawal A, Bhatnagar T, Chatterjee P, Das S, Gangakhedkar R, Gupta A, Gupta N, Gupta P, Gupta R, Kumar A, Kumar M, Kumar R, Kumar S, Misra A, Sarkar S, Sharma N, Sharma S, Singh A, Singha. K, and Singh R have maximum citations in the literature.

Sharma n in the blue cluster and Misra A in the red cluster is the most cited author (646 times and 642 times, respectively).

For more detailed analysis, we can increase the number of clusters that will reduce number of authors in each cluster for better comparison.

By changing the resolution in the bibliometric map from 1 to 5, the number of clusters in the map increases from 12 to 33.

The resolution should be a nonnegative number. The higher the resolution, the higher will be the number of the cluster formed.

Conclusion

Lowincome or middleincome countries get affected due to lack of significant hospitals and emergency transportation infrastructure. The number of hospital beds and ventilators quite low as compare to the highincome countries, and the resources and system are overwhelmed. Significant increase in the mortality rate and increase in the number of cases is a challenging condition causing health system to be overwhelmed has been observed. Every possible step should be made to minimize the loss like patients who do not require any hospital treatments can be care at home only critical patient (who has need ventilations and blood pressure support) should be care at hospitals which can be minimize the burden on hospitals. Most cases of COVID19 are mild and do not require hospital care. Many patients will respond to these inventions and can be kept at initial treatment until not recover properly. The patients who recovered and require low oxygen, discharged at home with written precautions.

Maybe it is possible that in upcoming days new evidence will emerge and change the way of preventions and treatment strategies of COVID19. In the COVID19 pandemic, people who were infected for a long term are at greater risk of facing the worst clinical outcome such as older age patients and pregnant women. The discharge criteria should be improved like after 14 days patients were discharged it should be 10 days when the first positive PCR result comes. Reduction in the tuberculosis treatment facility is observed due to lack of resources, lockdown, selfisolation, and other public health guidelines to prevent the virus transmission affected the delivery of essential facilities to tuberculosis management.

Limitations and future research

There are some limitations to this research, which suggest that there is a requirement for further research. Edition of random keywords to the articles may affect the result. Maps and timelines may be impaired. In future may be more tools were invented which give accurate result as of now.

Few articles from the indexes may not match the Scopus. A review of literature list may be not be completed which may affect the results. Theories and future studies may impact the study greatly by the outcomes. Bibliometric study given the value of scientific studies and influences of the work comparison of huge data with Scopus is difficult.

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Guarantor:	Dr. Ajay Bahl will act as guarantor of this article on behalf of all co-authors.

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