Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Indian Publications on SARS-CoV-2: A bibliometric study of WHO COVID-19 database

Vasantha Raju N [a, *], S.B. Patil [b]

[a] Government First Grade College, Talakadu, Karnataka, India
[b] Department of Library & Information Science, Shivaji University, Kolhapur, Maharashtra, India

ARTICLE INFO

ABSTRACT

Background & aims: Nowadays, the whole World is under threat of Coronavirus disease (COVID-19). The ongoing COVID-19 pandemic has resulted in many fatalities and forced scientific communities to foster their Research and Development (R&D) activities. As a result, there is an enormous growth of scholarly literature on the subject. We here in this study have assessed the Indian publications contributions on COVID-19.

Methods: WHO is curating global scientific literature on coronavirus since it declared COVID-19 a global pandemic through Global Research Database on COVID-19. The present study analyzed Indian publications on SARS-CoV-2 as found in WHO COVID-19 database. The research data was restricted for the period of March 2, 2020 to May 12, 2020.

Results: The study found that there is a considerable and constant growth of Indian publications on COVID-19 from mid-April. It is interesting to note that, the most prolific authors belong to either AIIMS or ICMR institutes. Delhi state contributed highest number of publications on COVID-19. The AIIMS, New Delhi was the most productive institution in terms of publications. The Indian Journal of Medical Research has emerged as the productive journal contributing highest number of the publications. In terms of research area, the majority of the publications were related to Epidemiology.

Conclusions: The highly cited publications were of evidenced based studies. It is observed that the studies pertaining to virology, diagnosis and treatment, clinical features etc. have received highest citations than general studies on epidemiology or pandemic.

1. Introduction

Coronavirus or novel coronavirus which is taxonomically termed as SARS-CoV-2 and named by World Health organization (WHO) as COVID-19 which emerged from Wuhan city, Hubei Province of China by the end of 2019 has caused unprecedented panic across the world. The rapid transmission of this virus from human to human made the World Health Organization (WHO) to declare this as the public health emergency of international concern and called it as global pandemic [1]. As on May 14, 2020, globally 4248389 COVID-19 cases have been reported and caused 292046 deaths. Highest human casualty reported from USA with 109121 deaths [2].

The first case of the COVID-19 pandemic in India was reported on January 30, 2020. As on May 17, 2020, the Ministry of Health and Family Welfare, Government of India has reported 90927 confirmed cases from 33 states with 2872 deaths [3]. Though India is in complete lockdown since March 24, over the weekend there is a rapid increase in COVID-19 cases in some states in India notably from Maharashtra, Gujarat, Tamil Nadu, Delhi, Madhya Pradesh and few other states. The rapid increase over the weekend in the month of May has created some kind of panic in India. The government and other civil bodies are making efforts to mitigate the spread of this virus.

Scientific literature on this pandemic is important in order to combat this novel coronavirus. Researchers across the world have been involved in identifying the cause, clinical features and developing possible vaccines for COVID-19. As a result there has been a rapid growth in publishing scholarly literature on the subject. Many academic institutions of international repute and also publication houses involving in scientific publishing industry have

* Corresponding author.
E-mail addresses: vasanthrz@gmail.com (V.R. N), sbp.lib@unishivaji.ac.in (S.B. Patil).

made their literature on COVID-19 or novel coronavirus freely available to the scientific community in particular for diagnosis, treatment and preventive strategies against the virus and public in general to create awareness of the infectious virus.

The Bibliometric studies which helps in quantifying the research publication pattern in a particular domain have also been done to assess the research productivity of scientific literature on COVID-19. Bibliometric studies help in identifying the emerging area of research, provide evidence of impact of research through citations, helps in identifying right scholarly literature to consult for study and also for carrying research forward, and it also helpful for policy makers to strategize the potential research areas and funding. There were few bibliometric studies on COVID-19 publications pattern worldwide [4–6]. However, there is hardly any studies on country specific. In this regard, here an attempt has been made to look into the Indian contributions to COVID-19 research publications.

2. Data source & methods

The study used World Health organization (WHO) COVID-19 database made available through WHO official website under global research on coronavirus disease (COVID-19) global research database as a data source for identifying the relevant literature on COVID-19. WHO COVID-19 [7] database is curating global literature publishing on coronavirus since it declared COVID-19 a global pandemic. WHO says that the database represents a comprehensive multilingual source of current literature on the topic. This database extract information from various bibliographic databases, hand searching, and the addition of other expert-referred scientific articles and updates daily.

WHO has made its COVID-19 database searchable freely and data can be exported to. CSV or RIS format. The search terms used for retrieving the data were "COVID-19" and "India". The "title, abstract and subject" option available on the database website was used to retrieve the documents. The search results retrieved 107 results for the search term. The database was search on May 12, 2020. The data was exported from. CSV format to excel sheet for further refinement of data and analysis. After thoroughly reviewing the data, it was found that there were few repeatable titles and titles not associated with Indian author or authors and articles other than English language were excluded from the study. Only articles written in English were included in the study. In all 89 articles were considered for the final analysis.

The study analyzed the date-wise Indian publication pattern on COVID-19, most prolific authors, institutions with highest publications, states with highest publication based corresponding authors state affiliation, top journals in which Indians have published their publications frequently and document types and research areas, author keywords tree map analysis and highly cited COVID-19 documents of Indian authors. For retrieving the citation data for identifying the top cited documents, Google Scholar citation database was used. In order to determine the research focus or areas of Indian publications on COVID-19, the author used the similar subject categories of earlier study done by Lou et al. [8] on coronavirus. For identifying journal impact factor, the Scopus CiteScore and SCImago Journal Ranking & Country Ranking was consulted.

3. Results of the study

3.1. Date-wise publications pattern

Fig. 1 indicates the date-wise daily publication pattern of Indian authors on COVID-19. All the publications that have been included in the study were curated from March 03, 2020 to May 08, 2020 in WHO COVID-19 database. As it can be seen from Table- 1 that after mid-April there is a considerable and constant increase in number of publications published from Indian authors on the subject. Given the gravity of the problem and the virus infectivity scale, it is obvious that medical researchers have been looking for potential treatment or vaccines for this virus and this has increased the output of research in India and in other parts of the globe as well. Clinical trials for identifying vaccine or potential drug for COVID-19 is in full swing. The clinicaltrials.gov database has listed 1510 studies on COVID-19. This indicates the increasing interest and rapidity in which research studies have been carried out on this virus.

3.2. Prolific Indian authors engaged in COVID-19 research

Table 1 depicts the most prolific Indian authors who have published three or more articles. Of the 89 articles, only 13 (14.60%) articles were single authored publications remaining articles were authored collaboratively. Nivedita Gupta of Division of Epidemiology & Communicable Diseases, ICMR, New Delhi, topped the list with 6 (6.74%) publications. Following her, Tarun Bhatnagar, National Institute of Epidemiology-ICMR, Chennai, Tamil Nadu, Raman R Gangakhedkar, SidharthaGiri of Division of Epidemiology & Communicable Diseases, ICMR New Delhi have contributed 4 articles each. Other authors with three or more publications can be seen in Table 1. Anoop Misra is the only outlier in the Table. The other authors listed in the Table either have associated with Indian Council for Medical Research (ICMR), New Delhi or National Institute of Virology, Pune which is also part of ICMR. Except Anoop Misra of Fortis CDOC Hospital, New Delhi, the rest of the prolific authors have published their articles in collaboration. Nivedita Gupta, Bhatnagar, Gangakhedkar and Giri have published together and other group consisting of Potdar, Yadav, Abraham and other authors from NIV have published together.

3.3. State-wise Publications Based on corresponding Author's state affiliation

The state-wise publication profile was created by using corresponding author state affiliation. The geographic heat map (Fig. 2) indicates state-wise publications on COVID-19. Delhi with 20 (22.47%) publications has produced highest number of publications on this subject. West Bengal with 11 (12.36%) publications ranked second in the order followed by Maharashtra with 9 (10.11%) publications. Chandigarh, Karnataka and Tamil Nadu have contributed 4 publications each with 4.49% share among the total output of India. Haryana, Punjab and Rajasthan have published 3 (3.37%) papers each. In Northern part, Delhi, Punjab and smaller state like Chandigarh has performed better. BIMARU states like Madhya Pradesh, Uttar Pradesh have published only one article each, Bihar has not published even a single paper on this topic. These states are largest in terms of their population. No research publications on COVID-19 have appeared from North Eastern region. It is right time to increase the research output and have better healthcare facilities across India, instead situating in few pockets.

3.4. Most prolific Indian institutions on COVID-19 research

The bubble chart (Fig. 3) depicts the top 8 highly productive Indian institutions that have published three or more publications on COVID-19 during the reported period. In all, two hundred and forty two institutions have involved in publishing 89 papers. The All India Institute of Medical Sciences (AIIMS), New Delhi with 8 (3.31%) publications topped the list followed by Post Graduate
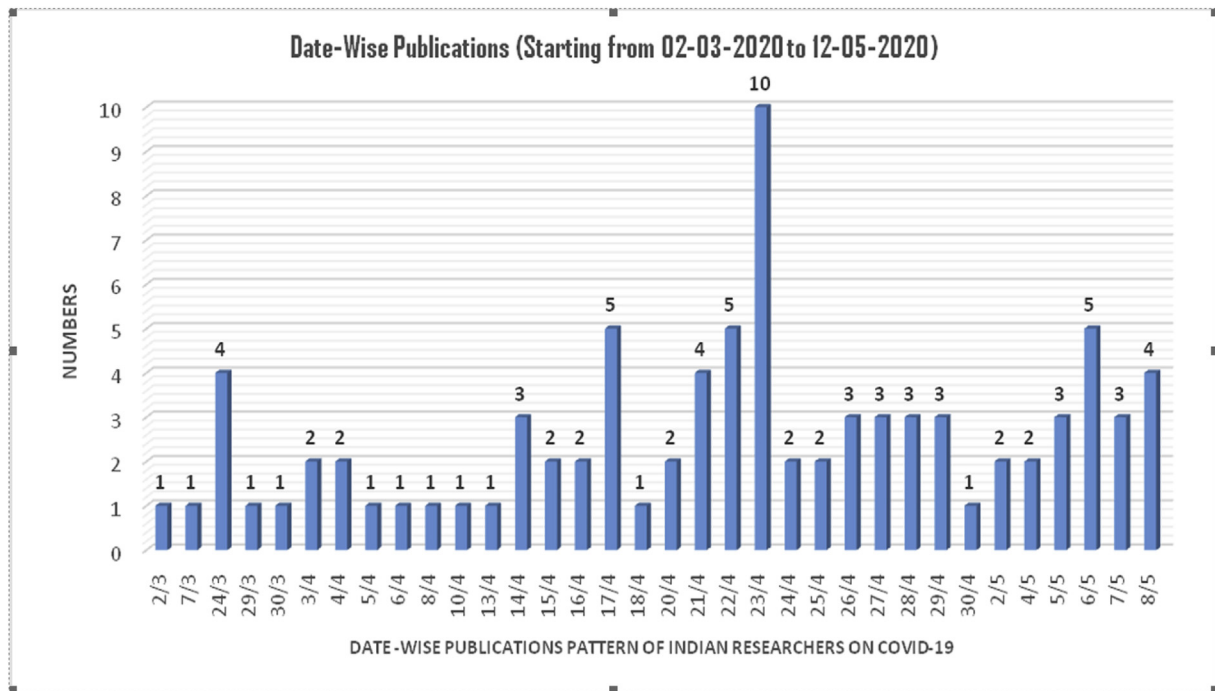
Fig. 1. Date-wise Indian publications on COVID-19.

Table 1
Author(s) with three or more publication on COVID-19.

Author Name	Institutional Affiliations	Number of Publications	% of 89
Gupta, Nivedita	Division of Epidemiology & Communicable Diseases, Indian Council of Medical Research, New Delhi, India	06	6.74
Bhatnagar, Tarun	National Institute of Epidemiology-ICMR, Chennai, Tamil Nadu, India	04	4.49
Gangakhedkar, Raman R.	Division of Epidemiology & Communicable Diseases, Indian Council of Medical Research, New Delhi, India	04	4.49
Giri, Sidhartha	Division of Epidemiology & Communicable Diseases, Indian Council of Medical Research, New Delhi, India	04	4.49
Misra, Anoop	Fortis CDOC Hospital for Diabetes and Allied Sciences, New Delhi, India	04	4.49
Potdar, Varsh	National Institute of Virology-ICMR, Pune, Maharashtra, India	04	4.49
Yadav, Pragya D.	National Institute of Virology-ICMR, Pune, Maharashtra, India	04	4.49
Abraham, Priya	Electron Microscopy & ICMR-National Institute of Virology, Pune, Maharashtra, India	03	3.37
Basu, Atanu	Maximum Containment Laboratory, ICMR-National Institute of Virology, Pune, Maharashtra, India.	03	3.37
Choudhary, Manohar Lal	Bioinformatics & Data Management Group, ICMR-National Institute of Virology, Pune, Maharashtra, India.	03	3.37
Murhekar, Manoj V.	National Institute of Epidemiology-ICMR, Chennai, Tamil Nadu, India.	03	3.37
Nyayanit, Dimpal A.	Maximum Containment Laboratory, ICMR-National Institute of Virology, Pune, Maharashtra, India.	03	3.37
Shete-Aich, Anita	Maximum Containment Laboratory, ICMR-National Institute of Virology, Pune, Maharashtra, India.	03	3.37

Institute of Medical Education & Research (PGIMER), Chandigarh with 7 publications (2.89%) and Indian Council of Medical Research (ICMR), New Delhi and National Institute of Virology, Pune with 6 (2.48%) publications each respectively. National Institute of Epidemiology, Tamil Nadu and Fortis CDOC Hospital for Diabetes and Allied Sciences, New Delhi have 4 (1.65%) publications each to their credit. Armed Force Medical College, Pune and Maulana Azad Medical College, New Delhi have published 3 (1.24%) papers each. It is noteworthy that AIIMS and ICMR are two premier medical institutions in India that have been guiding Government of India in combating the lethal infectious disease COVID-19. It is worth mentioning that, the National Institute of Virology, Pune has recently developed IgG ELISA test kit for coronavirus for speeding the antibody test, which is a first of its kind in India [9].

3.5. Most prolific journals preferred by Indian authors for publishing their works on COVID-19

The Indian authors have published their publications on novel coronavirus or COVID-19 in 51 journals. Table 2 presents the top

journals in which publications were frequently appeared. The Indian Journal of Medical Research (IJMR) has emerged as the top journal with 14 (15.73%) publications followed by Diabetes & Metabolic Syndrome: Clinical Research & Reviews and Science of the Total Environment with 6 (6.74%) publications each. Indian Journal of Ophthalmology has 4 (4.49%) publications to its credits and it's in third position in the Table. International Journal of Research in Pharmaceutical Sciences and Virus Disease have contributed 3 (3.37%) publications each and stands at fourth position. In all, these 13 journals have published 50 research papers which accounts for 56.19% share among the total publications output. All the journals which are even under Paywall content have made their preprints available freely for the researchers working on SARS-CoV-2. This will help the researchers to speed up their works related to the development of potential vaccines or drugs for this virus.

3.6. Research Area and Document Type of COVID-19 publications

Fig. 4 indicates the research area and the document type of the Indian publications. Of the 89 publications 38 (42.70%) were
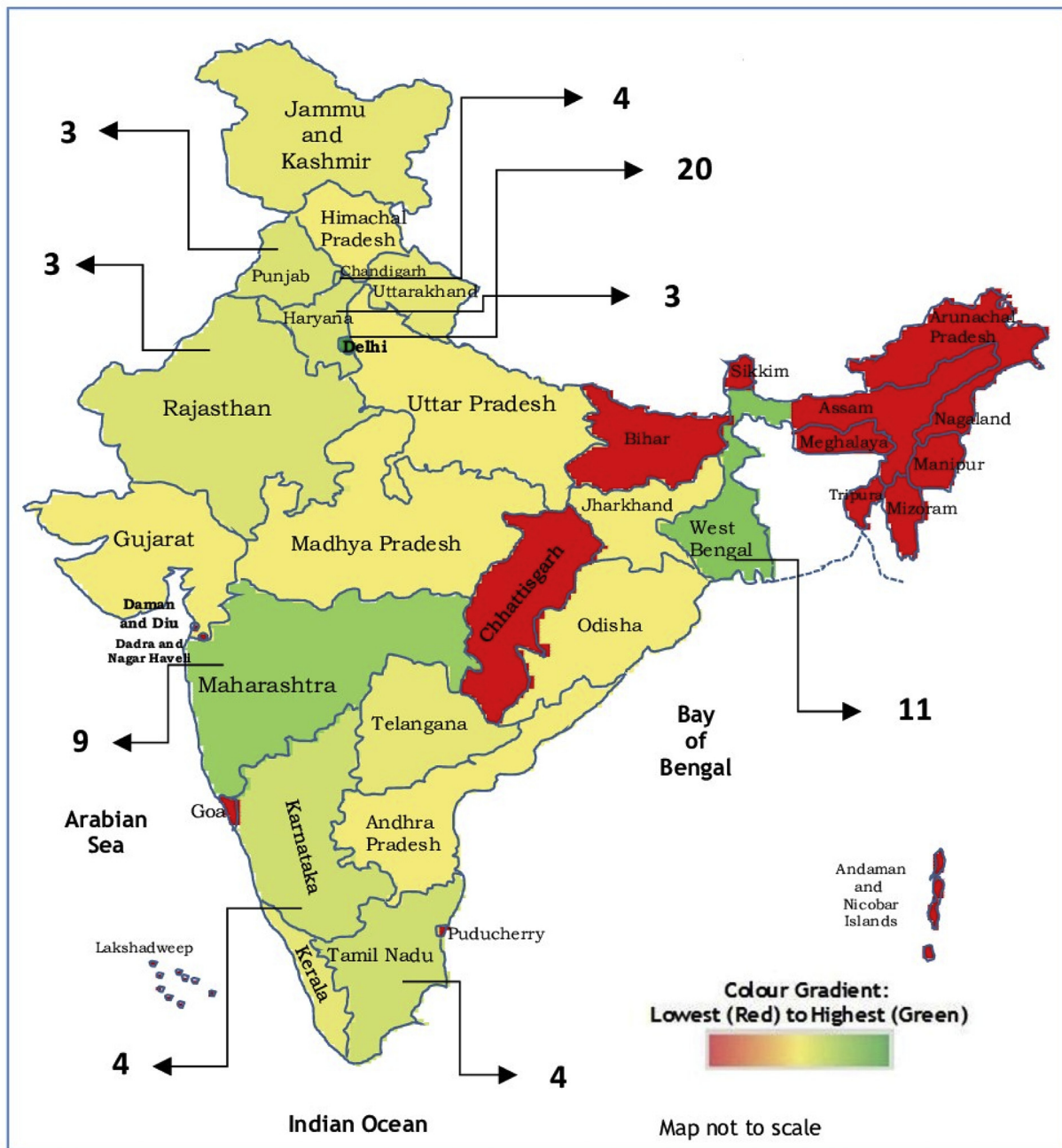
Fig. 2. State(s) publications based on the correspondence Author's affiliation.

articles, 13 (almost 15%) were of letters to editor or correspondence, 12 (13.48%) were commentary/opinion/perspective/viewpoints kind of documents, 7 (7.87%) were reviews, 6 (6.74%) were of guidelines/protocol/report related publications, another same number of documents were news items, 5 (5.62%) were editorials and 2 (2.25%) were short communications. If one were to see the document type, all kinds of documents ranging from articles to short communications were published. In terms of research area, of the 89 publications 75 of them were related to Epidemiology, which accounts for 84.27% of the total publications, 6 (6.74%) were related to Diagnosis & Treatment, 4 (4.49%) publications were on virology and 3 (3.37%) publications were of laboratory Examinations related studies and 1 (1.12%)publication was on clinical features of COVID-19 patients. Fig. 4 clearly indicates the Indian research publication

pattern with regard to research area. There were lot of studies on Epidemiology and its impact on diabetes, cardiologic patients and pandemic outbreak in India, less on clinical and laboratory examinations of COVID-19 patients and virology which are important for finding drugs or vaccine for the virus.

3.7. COVID-19 publications keyword frequency

The hierarchical tree map (Fig. 5) indicates the frequency of author assigned keywords to the documents that they have published on COVID-19. Keywords are helpful in identifying key domains of research and its growth. The keyword corpus contained 415 words with 208 unique words, same have been used to identify the frequency of keyword occurrences on COVID-19. It is found that
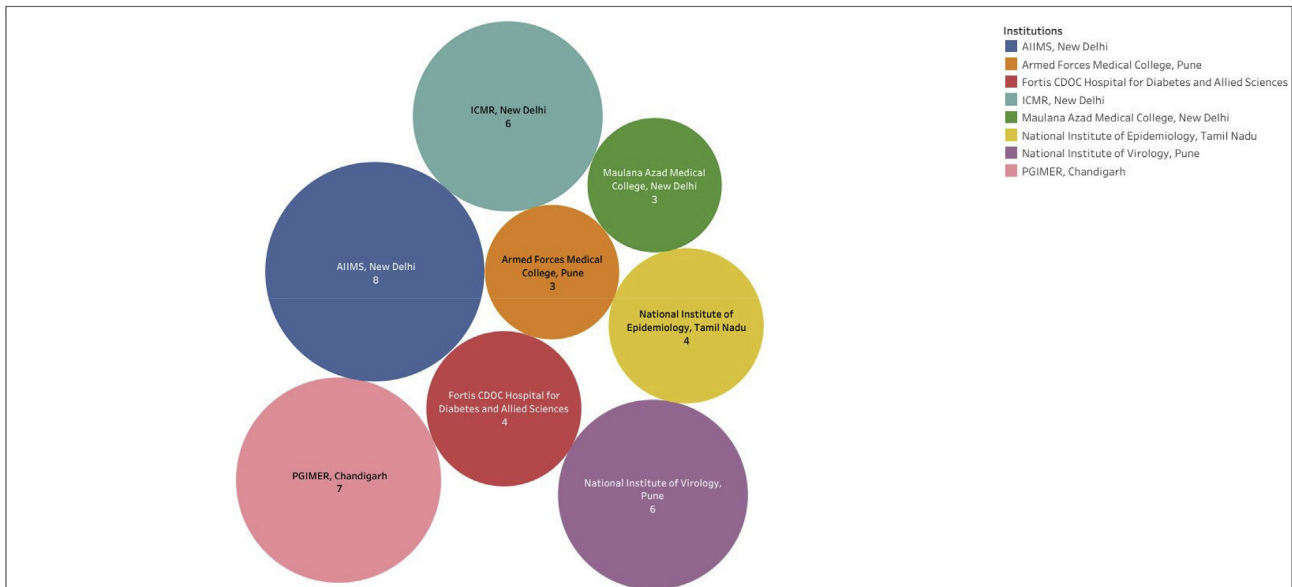
Fig. 3. Most prolific institutions on COVID-19 research through bubble chart.

Table 2
Top journals in which Indian COVID-19 research published frequently.

SL No.	Journal Name	Publisher	Number of Publications	% of 89	Journal CiteScore[a]
1.→	Indian Journal of Medical Research	Wolters Kluwer - Medknow	14	15.73	1.09
2.→	Diabetes & Metabolic Syndrome: Clinical Research & Reviews	Elsevier BV	06	6.74	2.08
3.→	Science of the Total Environment	Elsevier BV	06	6.74	5.92
4.→	Indian Journal of Ophthalmology	Wolters Kluwer Health	04	4.49	0.81
5.→	International Journal of Research in Pharmaceutical Sciences	JK Welfare &Pharmascope Foundation	03	3.37	0.21
6.→	VirusDisease	Springer India	03	3.37	0.97
7.→	Asian Journal of Psychiatry	Elsevier BV	02	2.25	1.29
8.→	C&EN Global Enterprise	ACS Publications	02	2.25	—
9.→	Infection Control & Hospital Epidemiology	Cambridge University Press	02	2.25	2.09
10.→	Medical Journal Armed Forces India	Elsevier India	02	2.25	0.55
11.→	Monaldi Archives for Chest Disease	Page Press Publications	02	2.25	0.53
12.→	JMIR Public Health & Surveillance	JMIR Publications Inc	02	2.25	—
13.→	The Lancet	The Lancet Publishing Group	02	2.25	10.28

[a] Based on 2018 Scopus CiteScore metrics.

the keywords "covid" (34 times), "coronavirus" (23 times), "India" (14 times), "pandemic" (12 times), "sars" (8 times) etc., have the highest frequency of occurrences.

3.8. Top five highly cited Indian Publications on COVID-19

Eighty Nine articles have received 186 citations in all with an average citations of 2.18 per documents. The article entitled "*Chloroquine and hydroxychloroquine in the treatment of COVID-19 with or without diabetes: A systematic search and a narrative review with a special reference to India and other developing countries*" authored by Awadhesh Kumar Singh et al. and "*Prudent public health intervention strategies to control the coronavirus disease 2019 transmission in India: A mathematical model-based approach*" authored by Sandip Mandal et al., and "*Fear of COVID 2019: First suicidal case in India!*" by Kapil Goyal and others have received 28 citations each and topped the Table, followed by the article "*Full-genome sequences of the first two SARS-CoV-2 viruses from India*" authored by Pragya Yadav with 18 citations. Other highly cited articles can be seen in Table 3.

If one were to simply observe the highly cited documents, it can be seen that publications which are of virology related, diagnosis and treatment or clinical features and simulations or mathematical

related studies have received more citation than general studies on epidemiology or pandemic. Eight out of six highly cited publications were appeared in two journals, they are: Diabetes & Metabolic Syndrome: Clinical Research & Reviews and Indian Journal of Medical Research (IJMR).

4. Discussion and conclusion

The results of the study reflects the current Indian scholarly publications on COVID-19 or SARS-CoV-2. Result of this study found some significant insights. The authors who have published more number of publications have all come from either AIIMS or ICMR institutions. Most of these authors have collaborated each other in publishing research papers on COVID-19 and have come from same institutions. This emphasizes that there is need to collaborate with other medical research institutions outside the intra-institute collaborations. It is interesting to note that more than eighty five percent of the articles on coronavirus were collaborative publications. Since COVID-19 is a global pandemic, collaborative research is the need of the hour to mitigate this infectious disease. The state-wise publication pattern indicates that except smaller states like Delhi, Chandigarh, Punjab and Haryana there are no significant publications from North India's largest states like Uttar Pradesh,
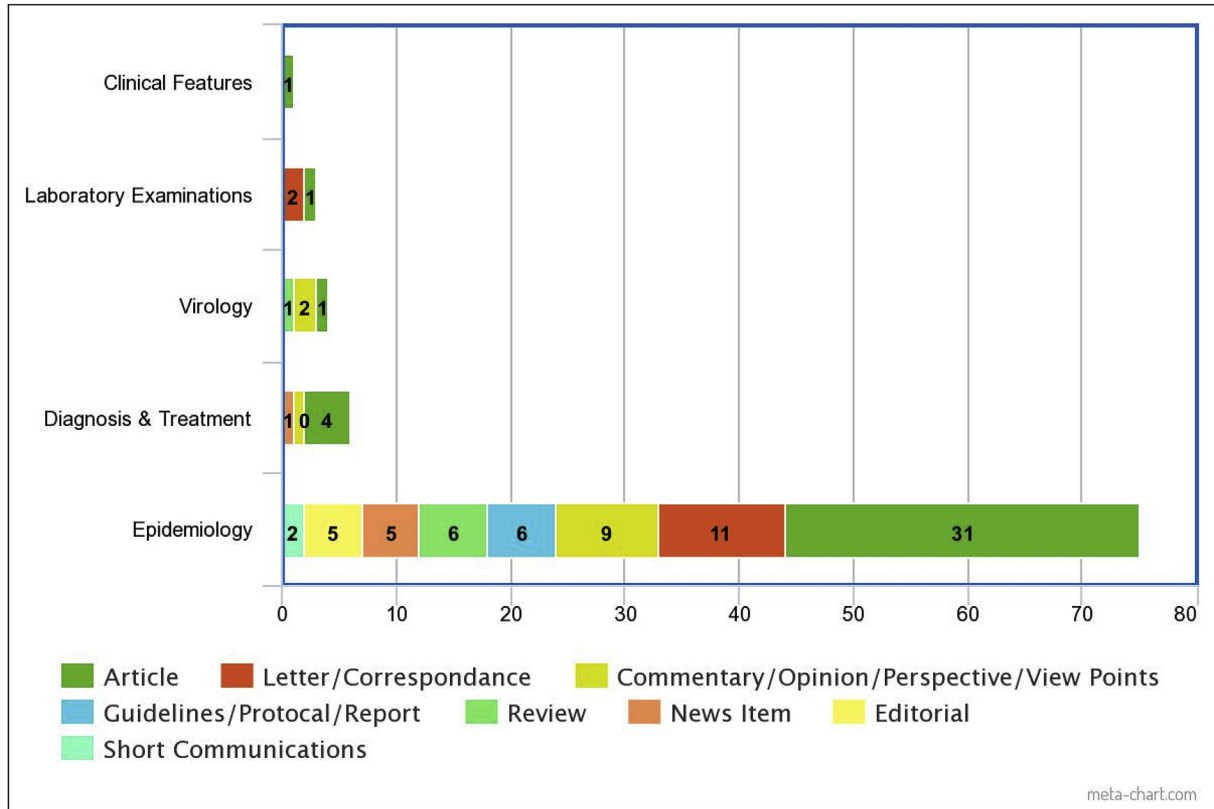
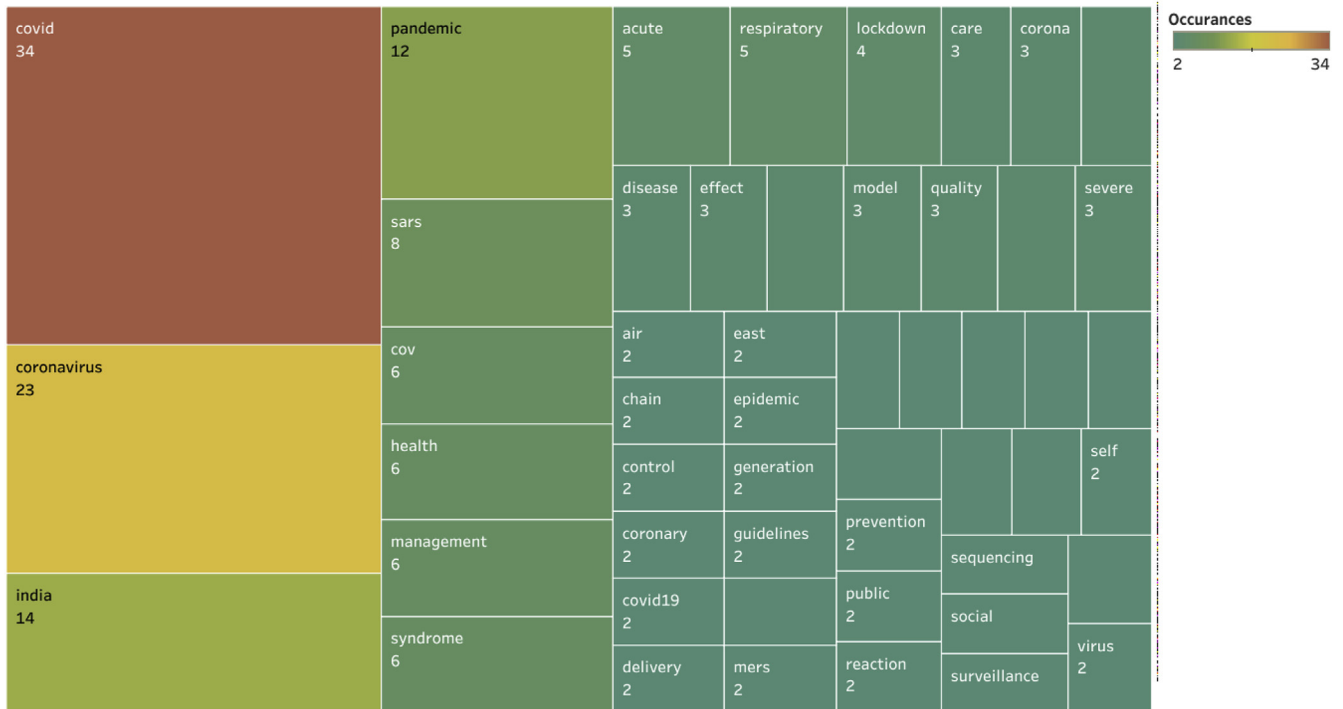**Fig. 4.** Research area and document type on COVID-19.

Fig. 5. Hierarchical tree map of frequency of keywords on COVID-19.

Madhya Pradesh and Bihar. This can be attributed for lack of medical or health science education and research institutions in this part. This is high time that the Government of India establishes

medical research institutes and strengthen healthcare facilities across India. The study found no publication from North Eastern Region states. This emphasizes need of robust medical

Table 3
Top five highly cited Indian publications on COVID-19.

SL No	Cited Documents	Author(s)	Journal Name	Number of Citations Received[a]	Journal h-index
1.→	Chloroquine and hydroxychloroquine in the treatment of COVID-19 with or without diabetes: A systematic search and a narrative review with a special reference to India and other developing countries.	Singh, Awadhesh Kumar; Singh, Akriti; Shaikh, Altamash; Singh, Ritu; Misra, Anoop	Diabetes & Metabolic Syndrome: Clinical Research & Reviews	28	25
2.→	Prudent public health intervention strategies to control the coronavirus disease 2019 transmission in India: A mathematical model-based approach.	Mandal, Sandip; Bhatnagar, Tarun; Arinaminpathy, Nimalan; Agarwal, Anup; Chowdhury, Amartya; Murhekar, Manoj; Gangakhedkar, Raman R; Sarkar, Swarup	India Journal of Medical Research	28	75
3.→	Fear of COVID 2019: First suicidal case in India!	Goyal, Kapil; Chauhan, Poonam; Chhikara, Komal; Gupta, Parakriti; Singh, Mini P.	Asian Journal of Psychiatry	28	24
4.→	Full-genome sequences of the first two SARS-CoV-2 viruses from India.	Yadav, Pragya D; Potdar, Varsha A; Choudhary, Manohar Lal; Nyayanit, Dimpal A; Agrawal, Megha; Jadhav, Santosh M; Majumdar, Triparna D; Shete-Aich, Anita; Basu, Atanu; Abraham, Priya; Cherian, Sarah S	Indian Journal of Medical Research	18	75
5.→	Telemedicine for diabetes care in India during COVID19 pandemic and national lockdown period: Guidelines for physicians.	Ghosh, Amerta; Gupta, Ritesh; Misra, Anoop	Diabetes & Metabolic Syndrome: Clinical Research & Reviews	09	25
6.→	Lopinavir/ritonavir combination therapy amongst symptomatic coronavirus disease 2019 patients in India: Protocol for restricted public health emergency use.	Bhatnagar, Tarun; Murhekar, Manoj V; Soneja, Manish; Gupta, Nivedita; Giri, Sidhartha; Wig, Naveet; Gangakhedkar, Raman	Indian Journal of Medical Research	09	75
7.→	Estimation of effects of nationwide lockdown for containing coronavirus infection on worsening of glycosylated haemoglobin and increase in diabetes-related complications: A simulation model using multivariate regression analysis.	Ghosal, Samit; Sinha, Binayak; Majumder, Milan; Misra, Anoop	Diabetes & Metabolic Syndrome: Clinical Research & Reviews	06	25
8.→	Healthcare impact of COVID-19 epidemic in India: A stochastic mathematical model.	Chatterjee, Kaustuv; Chatterjee, Kaushik; Kumar, Arun; Shankar, Subramanian	Medical Journal Armed Forces India	05	16

[a] Highly cited documents were identified through Google Scholar.

infrastructure in this region.

In terms of institutional publications profile, again ICMR, PGIMER and AIIMS and National Institute of Virology, National Institute of Epidemiology and other few have three or more publications. One of the interesting fact is that it is the government medical research institutions that have published large number of publications on COVID-19. AIIMS and ICMR, New Delhi and its other institutions in other parts of India, like National Institute of Virology, Pune and National Institute of Epidemiology, Tamil Nadu have shared largest publications on COVID-19. China and USA are way ahead of India in terms of their research publications on COVID-19 compared to their GDP and publications per million populations [10]. Central and State Universities which are in large numbers in India and they should accelerate their research capabilities at this time of global health crisis. In terms of journals, it is Indian Journal of Medical Research (IJMR) which has published more number of articles than any other journals, it accounts for almost 16% of total publications. ICMR and its other associated institutions have published largely in this journal on COVID-19.

Indian research is largely done in the area of epidemiology and its impact on diabetes, cardio patients, environmental impact and pandemic outbreak, less studies on clinical prognosis, pharmaceutical interventions, and laboratory based studies or virology related studies on SARS-CoV-2. The highly cited publications were of evidence based studies, for instance "Chloroquine and hydroxychloroquine in the treatment of COVID-19 with or without diabetes: A systematic search and a narrative review with a special reference to India and other developing countries" or "Prudent public health intervention strategies to control the coronavirus disease 2019 transmission in India: A mathematical model-based approach" which have been cited by 28 times and other studies as well. As this pandemic is no way to go early, the research is shifting from basic to experimental studies across the globe [6], if we see the top highly cited documents in India also gradually

studies are shifting more towards evidence based medical research for finding drugs or vaccine at the earliest for this highly infectious disease.

This bibliometric study though provides a bird-eye-view of the publications pattern of Indian authors on COVID-19, one must be a bit cautious in generalizing the results of this study. WHO COVID-19 database curated only expert-referred scientific articles and literature available through LitCOVID database of National Library of Medicine (NLM). It has not included the articles available through preprint servers or central subject repositories such as medRxiv and bioRxiv or arXiv, Research Square or SSRN preprint servers. It is suggested to take up a similar study using dimension. ai or semantic scholar's CORD-19 dataset which includes articles deposited in preprint servers on COVID-19 to see the different publications pattern of Indian Publications on novel coronavirus or COVID-19 in a much larger scale. The dynamic nature of inclusion of literature to the WHO database on a daily basis is also be considered while generalizing this study.

Funding

Author contributions

Idea and study design: Vasantha Raju N., and Patil S.B; Data collection and draft writing: Vasantha Raju N.; Revision and Finalization: Done by Both the Authors.

Declaration of competing interest

The authors declare that there is no conflict of interest.

References

[1] Song P, Karako T. COVID-19 Real-time dissemination of scientific information to fight a public health emergency of international concern. Biosci Trends 2020;14:1—2.

[2] World Health Organization. Coronavirus disease (COVID-19) (situation report No. 115). WHO; 2020. Retrieved from, https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports/.

[3] Ministry of Health and Family Welfare, Government of India. COVID-19 India dashboard. Retrieved from, https://www.mohfw.gov.in/; 2020.

[4] Dehghanbanadaki H, Seif F, Vahidi Y, Razi F, Ehsan H, Majid K, Aazami H. Bibliometric analysis of global scientific research on Coronavirus (COVID-19). Med J Islam Repub Iran 2020:34—51. https://doi.org/10.34171/mjiri.34.51. Retrieved from.

[5] Hossain MM. Current status of global research on novel coronavirus disease (COVID-19): Abibliometric analysis and knowledge mapping. Retrieved from, https://papers.ssrn.com/abstract=3547824; 2020.

[6] Nasab FR, Rahim F. Bibliometric analysis of global scientific researchon SARSCoV-2 (COVID-19). Retrieved from, https://doi.org/10.1101/2020.03.19.20038752; 2020.

[7] WHO global research on coronavirus disease (COVID-19) database. Retrieved from, https://www.who.int/emergencies/diseases/novel-coronavirus-2019/global-research-on-novel-coronavirus-2019-ncov; 2020.

[8] Lou J, Tian SJ, Niu SM, Kang XQ, Lian HX, Zhang LX, Jhang JJ. Coronavirus disease 2019: a bibliometric analysis and review. Eur Rev Med Pharmaco 2020;24:3411—21. Retrieved from, https://www.europeanreview.org/article/20712.

[9] Prasad R. Coronavirus: National Institute of Virology develops ELISA test to detect antibodies. The Hindu; 2020, May 10. Retrieved from, https://www.thehindu.com/sci-tech/science/coronavirus-indias-national-institute-of-virology-develops-elisa-test-to-detect-antibodies/article31551219.ece.

[10] Chahrour M, Assi S, Bejjani M, Nasrallah AA, Salhab H, Fares MY, et al. A Bibliometric Analysis of COVID-19 research activity: a call for increased output. Cureus 2020;12(3):e7357. https://doi.org/10.7759/cureus.7357. Retrieved from.