

EDITORIAL

COVID-19 RELATED INDIAN PREPRINTS ON SELECTED SERVERS

AUTHORS

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SUMMARY

This research aimed to determine the growth of preprint deposition on servers by Indian researchers during the COVID-19 pandemic.

In the pre-pandemic period, the dominant server was arXiv , in which physics research and other related domains have been the most predominant depositors.

When the pandemic broke out and the need to share research results became imperative, many previously down preprint servers received vibrant activations from various scientists around the world.

This is with the intention of bridging the gap between the delays inherent in the review process and the dire need for information sharing to find lasting solutions to the raging pandemic.

Many researchers, institutions, countries, etc. have contributed in this regard.

The study used a quantitative method and an expert-curated source from the iSearch Portfolio for publications and preprints related to COVID-19 or the novel coronavirus SARS-CoV-2 developed and maintained by the National Institutes of Health (NIH), US iSearch COVID- 19 Portfolio.

The study examined Indian COVID-19 preprints deposited on preprint servers bioRxiv and medRxiv . The findings indicated that Indian researchers published their articles in large numbers on bioRxiv and medRxiv with medRxiv with the highest preprints (417, 40.44%) in 2020 vs. its bioRxiv counterpart (118, 10.96%) in the same year.

Similarly, infectious diseases (except HIV/AIDS) (311) had the highest recurrence of preprints sent for server deposit. They are followed by epidemiology (263), public and global health (122), bioinformatics (59), among others.

There is great collaboration among the researchers who deposited their preprints on these servers, where around 257 (24.93%) preprints were co-authored by more than 11 authors, followed by 3 and 4 authors with 124 preprints respectively (together they represent 24, 06%) and 2-authored (114 (11.04%) preprints) respectively in decreasing order. The study concluded that Indian researchers are actively participating in repository of preprints on servers, in particular bioRxiv and medRxiv.

KEY WORDS : COVID-19, preprints , India, bioRxiv , medRxiv , bibliometric study

INTRODUCTION

When immediacy meets the decision-making process about the health emergency posed by the COVID-19 pandemic, preprints serve as intermediaries between researchers, the audience, and the peer review process (Majumder & Mandl , 2020; Otridge et al ., 2022).

Although there has been a yearning on the part of academics to change the preprinted nomenclature to “not refereed”. manuscript ‘, ‘manuscript awaiting peer review’, ‘unreviewed manuscript ’ (Ravinetto et al., 2021, p. 3), this is where a decision support tool developed by Good Publication Practice (GPP) and the International Committee of Medical Journal Editors (ICMJE) becomes imperative and relevant (Mathew et al., 2022).

There is a different perception about the acceptance of the preprint as complete (Berg et al., 2016) or incomplete (Añazco et al., 2021), which is still pending and debatable. The completeness or incompleteness of preprints encountered with COVID-19 has set the stage for the urgent need to discover and the pressing need to share relevant information.

The fact that “the potential benefits of preprints always outweigh the risks of harm” (Ravinetto et al., 2021, p. 3), implies that preprints provide readily available evidence-based findings for audience consumption.

This is so to the extent that the COVID-19 pandemic has changed the culture of research, generating, in a relatively short period of time, a volume of research that even the most emerging fields such as deep learning or nanotechnologies have taken years to produce (Porter & Hook, 2020).

This is mainly because the research results are shared with the public before publication, which increases the maximum audience, even if the journals are not open access, which increases the productivity of the research (Añazco et al ., 2021).

This arises from the urgency and imperative to share relevant information following the promulgation of the International Committee of Medical Journal Editors (ICMJE), WHO and many academic journals urging authors to share their research findings on preprint servers before to submit to the formal peer review process (Añazco et al., 2021). The acceleration of science and technology depends to a large extent on the generation of new ideas fueled by the creativity that provides innovations.

One of the ways to create new ideas is the rapid production and dissemination of findings, generally communicated through preprint servers or journals (Celi et al., 2021). As of June 25, 2021, there were about 140,000 COVID-19 manuscripts published or published in PubMed , bioRxiv , and medRxiv (Tong et al., 2021), indicating a new dawn of rapidly evolving research.

Preprint server arXiv was the first server populated and popularized by the physics, mathematics and computer science community in 1991 (Vlasschaert et al., 2020). Some researchers have shown that there have been preprints since 1961, but they closed in 1967 due to resistance from journals (Otridge et al., 2022).

To follow the tail, the life sciences community has also adopted the preprint server bioRxiv founded in 2013 with over 75,000 preprints as of March 2020 (Vlasschaert et al., 2020).

In 2018, from October to November alone, there were more than 2.2 million downloads where around 170 journals collaborated with bioRxiv forming a process called B2J that facilitates the transfer of preprints to journals for peer review.

(Vlasschaert et al., 2020).

Unlike preprints on arXiv, researchers who deposited their preprints on bioRxiv faced some criticism as many journals failed in such attempts.

However, many journals have revised and reversed their policies and now accept preprint articles. (Vlasschaert et al., 2020).

In June 2019, the preprint server was launched medRxiv, which aims to “ improve the openness and accessibility of scientific findings, enhance collaboration between researchers, document the provenance of ideas, and report on ongoing and planned research through more timely reporting of completed investigations ” (Vlasschaert et al., 2020, p. 2).

Despite the presentation of results at conferences and educational blog posts, timely access to scientific findings contained in preprints threatens the authenticity of research, as researchers are concerned about the danger of using information contained in preprints before undergoing a peer review process (Vlasschaert et al . al., 2020). Despite the observed challenges, preprints serve as an important ingredient for creativity and innovations.

Perhaps this is related to the rapid advancement of physics in the development of equipment, the refinement of research methods, the improvement of measurement procedures, especially in cosmological parameters used in radiation physics, nuclear forensics, radiotherapy, radiation oncology, etc.

This is true since Satish et al., (2020) have linked the novelty of new ideas with the point of change detection analyzed through binary or bottom-up segmentation, availability of new terms and phrases in scientific publications, and time. required for public appearance consumption.

The speed with which scientific findings are communicated is visible through preprints despite containing a hidden risk to public discourse (Celi et al., 2021) and

this is why preprints continue to receive recognition for various reasons.

Some of the reasons include their 5x citation rates compared to non-preprint scholarly products and their penetrating power to reach the scholarly community 14 months sooner than their non-preprint counterparts (Xie et al., 2021).

Under traditional publishing conditions, a manuscript requires at least 6 months of scientific (peer) scrutiny (Fraser et al., 2021) through blind, double, triple, etc. reviews, depending on the domain and quality of the manuscript. Among advocates of the peer review process, some agree that the peer review process ensures the rigor of scientific findings, while others view it as slow, imperfect, and prone to bias (Celi et al., 2021).

This duality opened windows for the introduction of preprint servers to serve as a solution to highlighted persistent challenges and an avenue through which scholars can share early-stage research with high-speed open collaborations and public scrutiny before submitting it to the public journal for the peer review process (Celi et al., 2021).

In doing so, scholars have found that there is an approximately 63-fold increase in the distribution of preprints in the last 30 years, but it accounts for only 4% of published research papers (Xie et al., 2021).

A reduction in the number of days to publish COVID-19 related articles is observed compared to non-COVID-19 submissions, which is within 120 days (Kodvanj et al., 2022).

PREPRINTS AND THEIR EVOLUTION

Preprints, a disruptive force in scientific communication, have become one of the main sources of scientific information with potential for exponential growth and as a model for disseminating research results (Vlasschaert et al., 2020).

However, many researchers criticized the reliability of the findings and cautioned authors and publishers to “ check the accuracy of the results.” citations and preprint citations before publishing citing manuscripts them” (Gehanno et al., 2022). To add to this argument, (Bero et al., 2021) compared the discrepancies in results in preprints and journal articles after publication and spin-in.

INTERPRETATION

Of the 67 preprints studied, 23 (34%) had no discrepancy in the preprints and journals, 15 (22%) studies had at least one result mentioned in the journal not in the preprint , and 8 (12%) had one result mentioned only in preprints (Bero et al., 2021). Overall, they found the results in preprints to be largely similar to those reported in their corresponding journals,

and cautioned that reviewers should critically observe and appraise discrepancies and pivot on these research results (Bero et al., 2021). .

This is probably why Kumar Verma et al., (2022) noted the hesitancy among health science librarians to get vaccinated despite its 2021 development due to safety, negative information, and confusion surrounding the vaccine itself. This could have resulted from differences in attitudes towards the deposit of preprints on servers subscribed to by the specific domains of the journal.

For example, Yi and Huh , (2021) found that, of 365 respondents to their research, 56 deposited submitted their manuscripts on preprint servers, with more than half having the attitude of preferring to deposit preprints, promote open access, get feedback on preprints, get appointments, etc.

The researchers concluded that there is a need for flexible policies to publishers to accept preprints in Korea (Yi & Huh , 2021).

Preprints were common on the arXiv server populated by physics, math, computer science, science, but the COVID-19 pandemic has accelerated the rate at which scholars from other disciplines deposit their content on other servers before the actual preprint takes place in review process (Majumder & Mandl , 2020).

This is true even though preprints they are considered precursors to peer-reviewed articles, they need proper scrutiny and assurance of adherence to ethical policies before releasing them to the audience for public consumption (Texeira da Silva, 2021).

A careful scrutiny of the high increase in preprints in the biomedical domain, the COVID-19 pandemic has consolidated the boom in the use of this information as resources to better understand the pattern of progression of the virus and the need to develop a vaccine (Majumder & Mandl , 2020).

COVID-19 Science Update reported on topics ranging from health equity, vaccine, variants, natural history, testing, etc. (Otridge et al., 2022).

From the review, it is available in the literature that the policies surrounding prepress deposition are country specific; some countries have high deposition while others have low deposition.

For example, Yi and Huh, (2021) conducted research in Korea and found that there is little use of preprints in Korea despite the fact that some researchers showed positive attitudes towards depositing their research on preprint servers.

In other words, the research indicated that engineering researchers had prior knowledge about preprints than their medical counterparts.

The specificity of the discipline also plays a vital role in in-

fluencing the preprints on ad hoc servers (Yi & Huh, 2021). As Indian research is still evolving, capturing these issues of importance is equally important in understanding researchers' attitudes and behavior regarding their willingness to deposit preprints on preprint servers.

This will help policymakers in a number of ways to implement relevant policies that could guide international standards compliance conduct in the repository of preprints, reports, etc., prior to the peer review process.

This implies the need to investigate the growth of prepress in a country or discipline scholar to understand the pattern of contributions made by researchers from those countries.

The current study is an attempt to understand the growth of preprints in India during the COVID-19 pandemic.

RESEARCH QUESTIONS

The research attempts to answer the following questions:

1. What is the level of participation of Indian authors in the bioRxiv and medRxiv repository of COVID-19 preprints?
2. What are the publication characteristics of Indian COVID-19 preprints, in terms of institutional inputs, identifying prolific authors, highly cited preprints, and preprints with higher altmetric attention score (AAS) and understand other features of the publication?

METHODOLOGY

Data for the present study was obtained from the iSearch COVID-19 Portfolio, a

Comprehensive and expert-curated resource for publications and preprints related to COVID-19 or the novel coronavirus SARS-CoV-2, maintained by the National Institutes of Health (NIH).

This database indexes preprints deposited on seven preprint servers, including arXiv, bioRxiv, chemRxiv, medRxiv, preprints.org, Qeios, and Research Square, as well as peer-reviewed COVID-19 publications indexed in PubMed. For this study, we considered two major biomedical sciences preprint servers: bioRxiv and medRxiv.

Of the 44,594 preprints indexed in the iSearch COVID-19 Portfolio on 29

November 2022, these two servers represented 25,429 preprints (14.70% for bioRxiv with 6,555 preprints and 42.32% for medRxiv with 18,874 preprints), which is 57.02% of the total preprints available in this database.

The iSearch COVID-19 portfolio was searched using the terms "2019-nCoV OR 2019nCoV OR COVID-19 OR SARS-CoV-2 OR Coronavirus and India*" to retrieve Indian preprints deposited with bioRxiv and medRxiv.

Advanced Search, filters and search fields, such as Publication Date, Publication Types, Source Filters, Publication (DOI, PMID), People (Authors, Author Affiliation, First Au-

thor, Last Author), and Content (Title, Abstract, full text, condition and supplementary text), were applied to obtain data from COVID-19.

Preprints deposited from 01-01-2020 to 11-29-2022 were retrieved by Publication Date, Publication Type as "preprints" and Source as bioRxiv and medRxiv.

This process resulted in obtaining 3,867 preprints, with 891 preprints found for bioRxiv and 2970 preprints found for medRxiv using the keywords used in the study.

Initially, we used the "author location" option provided in iSearch COVID-19.

Portfolio database to limit Indian COVID-19 preprints, but this process resulted in identifying only 143 preprints due to jumbled and blank entries in the downloaded excel sheet.

Therefore, we abandoned this process and used Zotero's open source reference management software to get the PDF of the preprints through their DOIs.

PDF files of the 3,867 authors of this article examined preprints from December 1, 2022 to December 20, 2022 to identify Indian COVID-19 preprints on bioRxiv and medRxiv with at least one author associated with Indian institutions.

This process resulted in obtaining 1031 Indian COVID-19 preprints, with 240 preprints deposited in bioRxiv and 791 preprints published in medRxiv.

This sample was used as the final data set for the study and subsequent analysis.

To identify Indian COVID-19 preprints that have received a high level of citations and has a high Altmetric Attention Score (AAS), we obtained our Dimensions data (<https://dimensions.ai>), a vast and comprehensive scientific research database.

Also, we queried the Retraction database Watch (<http://retractiondatabase.org/>) to discover any reasons for retraction of Indian COVID-19 preprints: Powerful management reference Zotero was also used in this study.

It effectively marks any checked out documents, and provides easy access to these items through its item list feature.

(FIGURE 1: FLOWCHART DEPICTING THE DATA COLLECTION PROCESS)

RESULTS

1. Indian COVID-19 preprints on preprint servers bioRxiv and medRxiv

Figure 1 shows the annual distribution of Indian COVID-19 preprints (a) and the total number of preprints published on bioRxiv and medRxiv servers and total number of preprints per Indian (b).

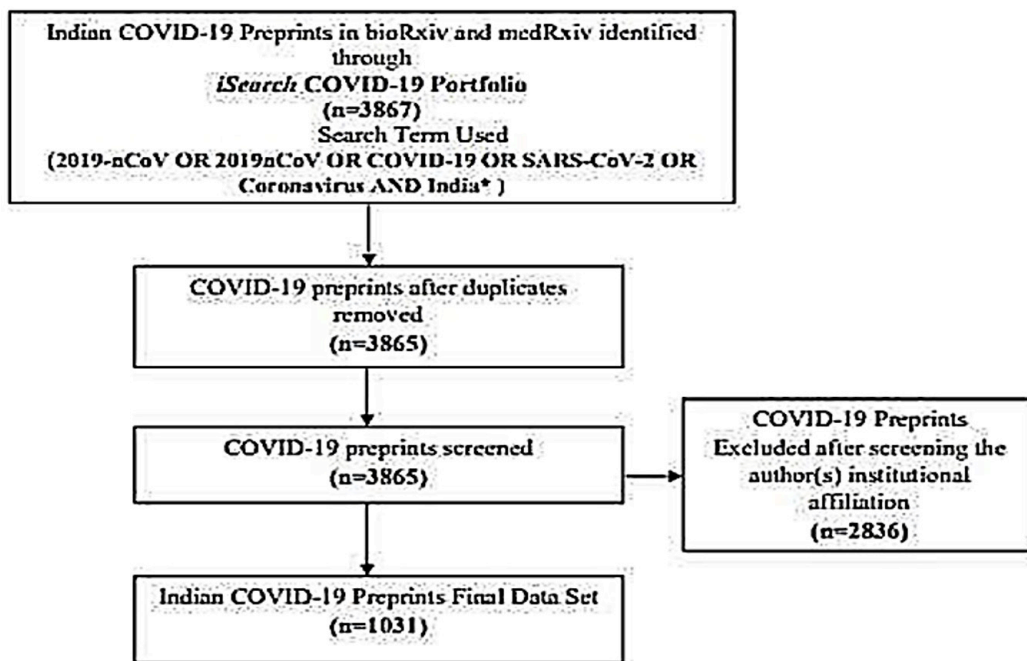


FIGURE 1: FLOWCHART DEPICTING THE DATA COLLECTION PROCESS

It is clear from the figure that Indian researchers have greatly contributed to the expansion of preprints in medRxiv (417, 40.44%) in 2020 versus its counterpart bioRxiv (118, 10.96%) in the same year.

Perhaps this was due to the sudden rise of the COVID-19 pandemic and the rapid response that researchers have undertaken to develop research-based approaches that could inform stakeholders on how to address the spread of the viral particle.

Despite the fact that in the following year 2021, there was a small decrease in the publication of preprints during this period due to the development of vaccines and relative herd immunity, Indian researchers did not let up in their search for durable solutions to the pandemic.

This resulted in the generation of 272 (26.38%) preprints in medRxiv and 92 (8.9%) in bioRxiv in 2021.

The implication of this finding is that Indian academics have not been averse to fighting the virus and contributed to the development of research that aided in vaccine development, logistics, to mention just a few.

This is consistent with the presentation by Singh et al., (2020) who suggested that Indian scholars should deposit their research in such repositories.

Furthermore, this is not a surprise since Porter and Hook, (2020) have indicated that,

COVID-19 has affected research output more than deep learning and nanotechnology have combined.

From another perspective, in the year 2022, the number of deposition preprints was drastically reduced 102 (9.89%) in medRxiv and 35 (3.39%) in bioRxiv probably

due to the development of vaccines and the reduction in the number of infections in the population.

There are 791 (76.72%) preprints deposited in medRxiv and 240 (23.28%) preprints in bioRxiv.

Overall, there are 1031 preprints submitted by Indian authors of beginning of 2020 to November 2022.

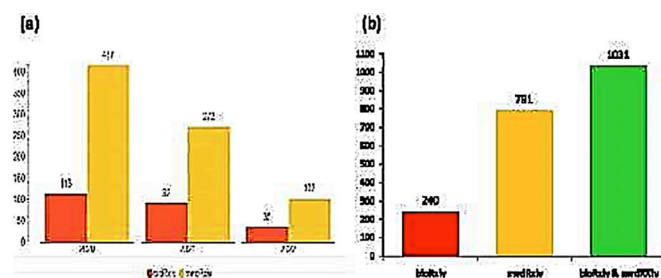


FIGURE 2: ANNUAL DISTRIBUTION OF INDIAN COVID-19 PREPRINTS (A) AND COVID-19 PREPRINTS SENT TO PREPRINT SERVERS BIORXIV AND MEDRXIV (B)

2. Types of COVID-19 Indian Preprint Licenses

Figure 2 presents the distribution of preprint licenses among researchers. The data shows that 42.58% of researchers selected the CC BY-NC-ND 4.0 license, followed by 32.30% choosing All Rights Reserved, 10.67% choosing CC BY-ND 4.0, 9.12% choosing CC BY 4.0, 4.85% choosing CC BY-NC 4.0, and just 0.48% choosing CC0.

This aligns with the findings of Fraser et al., (2021) who reported that authors have the option to choose between several Creative licenses. Commons when uploading your preprints to bioRxiv and medRxiv.

Creative licenses Commons include CC0 (No Rights Reserved), CC BY 4.0 (attribution), CC BY-NC 4.0 (attribution, non-commercial), CC BY-ND 4.0 (attribution, no derivatives), and CC BY-NC-ND 4.0 (attribution, non-commercial, without Derivatives).

A large portion of Indian researchers, 42.58%, selected the CC BY-NC-ND 4.0 License, which allows knowledge sharing without any limitations for public use.

3. Subject categories in which 10 or more COVID-19 preprints were published

Figure 3 illustrates the distribution of contributions in different subject categories made by Indian scholars.

The data reveals that the preprints most frequently sent to the servers were related to infectious diseases (other than HIV/AIDS) with 27.74% (286 preprints).

Epidemiology ranked second with 22.89% (236 preprints), followed by public and global publications, health (9.89%, 102 preprints) and bioinformatics (5.91%, 61 preprints). These findings are in line with the study by Fraser et al., (2021) who found that the subject areas of preprints deposited on servers were not limited solely to biomedical research.

This suggests that the COVID-19 pandemic has encouraged interdisciplinary collaboration among researchers, leading to examination of the challenges posed by the pandemic from multiple perspectives (Porter & Hook, 2020). Co-occurrence keyword network was produced using the VOS viewer bibliometric network software (version 1.6.18). The network diagram was created by using keywords that appeared 6 or more times, out of 4047 terms.

A total of 163 terms reached the threshold, resulting in the formation of five main groups, as shown in Figure 3(a). Group 1 (in red) consists of 28 keywords with terms such as “mathematician model”, “forecast”, “country”, “peak”, “trend”, “number”, “modelling”, and others. Group 2 (in green) consists of 24 keywords with terms related mainly to “hospital”, “severe covid”, “vaccination”, and “Indian population”, among others.

Group 3 (in blue) has 23 keywords with terms such as “sarscov”, “variant”, “mutation” and “detection”.

Group 4 (in yellow) has 12 keywords including “vaccine”, “health workers”, “chadox1 ncov”, “Kerala” and “Tamil Nadu”, and others.

Group 5 (in purple) contains 11 keywords with terms such as “safety”, “vaccine efficacy”, “bbv152”, “evaluation” and others.

These groups highlight the significance of COVID-19 studies conducted in India.

4. Number of authors associated with COVID-19 preprints

Figure 4 shows the number of authors in a publication.

From the figure it can be seen that around 257 (24.93%) preprints were co-written by more than 11 authors.

This is followed by 3-authored and 4-authored with 124 preprints respectively (together representing 24.06%) and 2-authored (114 (11.04%) preprints) respectively in decreasing order.

This implies that there is an increase in collaboration among Indian academics due to the pandemic and this pattern of collaboration has helped in finding appropriate solutions to the upsurge of the pandemic and developing vaccines.

Like Porter and Hook, (2020) reiterated that when a field develops rapidly, as in the case of COVID-19, there is an observable change in research, including new behaviors, changes in the pattern of collaboration, and uses of information collectively shape the field.

This is consistent with Waltman, et al., (2021, p. 73) who called for the collaboration of intersectoral and international organizations, and recommended collaboration between funders, government organizations, research institutions, and publishers to align their data “around a principle” as open as possible and as closed as necessary. These collaborations, oriented to preprint and data exchange, must be in a systematic and sustained manner accompanied by monitoring and accountability mechanisms (Waltman, et al., (2021).

From another perspective, these collaborations led to projects on the same theme.

collaboration, self-institutional collaboration, increased in life sciences and medicine, and no significant new pairings of research relationships outside of medicine/biology (Porter & Hook, 2020).

This means that most collaborations are in the field with respect to medicine and life sciences.

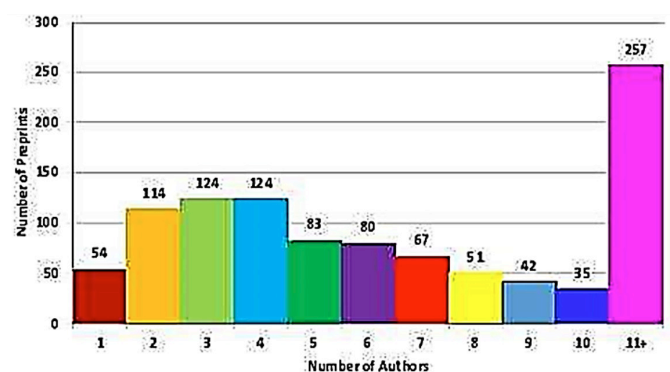


FIGURE 3: NUMBER OF AUTHORS ASSOCIATED WITH EACH COVID-19 PREPRINT

5. Prolific authors and institutions with more than 10 COVID-19 preprints

Figure 5 shows the top authors (a) and institutions (b)

that have published 10 or more COVID-19 preprints in India. The table reveals that Priya Abraham had the most preprints, with 16 representing 1.55% of authors with more than 10 preprints in India.

Other prominent authors are Madhvi Joshi and Samiran Panda with 14 preprints each, and Balram Bhargava and Nivedita Gupta with 13 preprints each. The data indicates that Indian researchers are actively contributing by depositing preprints on servers.

Most of the authors are affiliated with ICMR and its institutions and have collaboratively published preprints.

There is also a pattern in which authors affiliate with their own institutions.

collaborate more often than with external authors or institutions.

The analysis further highlights the connections between the main ICMR authors. priya

Abraham from ICMR-NIV, Pune has the strongest connections, with 113 links, and his main contributors are Samiran Panda, Balram Bhargava, nivedita Gupta, Pragya Yadav, Deepak and Patil, and others.

The AIIMS in New Delhi has the most preprints with 43, followed by the IISc in Bangalore with 26 preprints and the ICMR-NIV in Pune with 22 preprints.

The other higher institutions, as shown in Figure 5(b), work mainly in the field of medical and biomedical sciences, with the exception of the IIPS (International Institute of Population Sciences), which carried out studies related to mathematical models and infectious diseases.

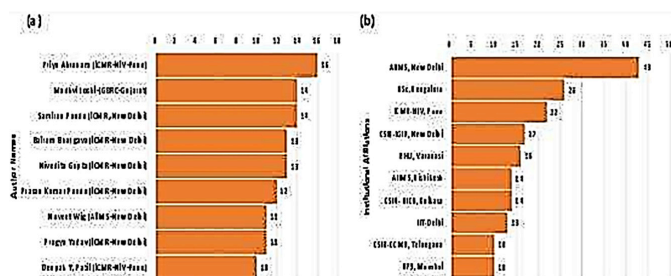


FIGURE 4: AUTHORS (A) AND INSTITUTIONS (B) WITH MORE THAN 10 COVID-19 PREPRINTS

6. COVID- 19 Preprints published in journals

Figure 6 presents a clear illustration of the number of COVID-19 related preprints published in academic journals. The figure shows that a total of 1031 preprints were submitted to preprint servers, with 240 of them deposited in bioRxiv and 791 submitted to medRxiv.

Of the 240 preprints submitted to bioRxiv, 118 (49.17%) were ultimately published in academic journals.

On the other hand, 165 (20.86%) of the 791 preprints submitted to medRxiv were published in journals.

These data add up to a total of 283 (27.45%) preprints published in academic journals.

The figure also highlights that almost half of the preprints submitted to bioRxiv were

published in academic journals. This suggests a change in the way research is communicated, with researchers increasingly choosing to deposit their preliminary results on preprint servers rather than submit them directly to journals.

This change highlights the increasing scope of research using preprint servers in today's era.

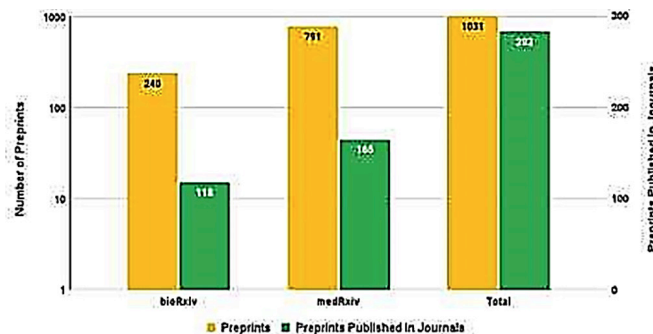


FIGURE 5: NUMBER OF COVID-19 PREPRINTS AND THEIR APPEARANCE IN JOURNALS

7. Top magazines that published Indian preprints of COVID-19

Table 1 shows the journals that have published 3 or more Indian preprint journals.

The top two journals in this category are PLOS ONE, a renowned multidisciplinary journal, and Scientific Report, another multidisciplinary journal.

PLOS ONE has published 14 Indian-authored preprints (Impact Factor: 3.752%) and Scientific Report has published 10 preprints (Impact Factor: 4.997%).

These results show that the high quality of Indian research is being recognized globally as these preprints are being accepted and published by leading high quartile ranking journals.

The B2J and M2J options available in bioRxiv and medRxiv allow authors to easily transfer their manuscript to journals without resubmitting or formatting.

Many major publishers, including PLOS, now encourage authors to deposit their preprints before submitting them to journals. This further reinforces the idea that preprint servers are an effective and efficient way to communicate research and its results.

RANGE NAME OF THE MAGAZINE NO. OF PREPRINTS PUBLISHED 2021

IMPACT FACTOR OF THE JOURNAL / THEMATIC AREA (RANKING OF THE QUARTILE OF THE JOURNAL)

1. PLOS ONE 14 3,752 Multidisciplinary Sciences (Q2)
2. Scientific Reports 10 4,997 Multidisciplinary Sciences (Q2)
3. Infection, Genetics and Evolution 6 4,393 Infectious Diseases (Q2)
4. International Journal of Infectious Diseases (Q1)
5. Frontiers in Immunology 5 8,787 Immunology (Q1)
6. Journal of Family Medicine and Primary Care
7. Virus research 5 6,286 Virology (Q3)
8. eLife 4 8,713 Biology (Q1)
9. Frontiers in Genetics 4 4,772 Genetics and Heredity (Q2)
10. Environmental Sciences Total 4 10,754 Environmental Sciences (Q1)
11. ACS 3 Applied Biological Materials - Nanoscience and Nanotechnology; Materials Science, Biomaterials
12. Clinical Infectious Diseases 3 20,999 Immunology (Q1)
13. Disaster Medicine and Public, Environmental and Occupational Health (Q1)
14. eBiomedicine , Medicine, Experimental Research (Q1)
15. Environmental Research 3 8,431 Environmental Sciences (Q1)
16. Cellular borders and infection. Microbiology and Immunology (Q2) and Microbiology (Q2)
17. Frontiers in Public Health 3
18. Journal of Biomolecular Structure, Biochemical Dynamics and Molecular Biology (Q1) and Biophysics (Q1)
19. Journal of Infection Infectious Diseases (Q1)
20. Journal of Medical Virology Virology (Q1)
- 21 Microbial Pathogenesis and Immunology (Q3) and Microbiology (Q3)
22. PLOS Computational Biology, Biochemical Research Methods (Q1) and Mathematics and Computation in Biology (Q1)
- 23 Vaccines and Immunology (Q3) and Medicine and Experimental Research (Q3)
24. Virology (Q3)

(TABLE 1: JOURNALS PUBLISHED WITH 3 OR MORE INDIAN COVID-19 PREPRINTS)

8. Highly Cited Indian COVID-19 Preprints

Table 2 shows the Indian COVID-19 preprints with many citations.

It is evident that both bioRxiv and medRxiv , the servers that host these research results, are highly sought after. The preprint “Reused antiviral drugs for COVID-19-WHO interim solidarity trial and its results” is the most cited with 263 citations. This preprint was in high demand due to its crucial role in determining effective pharmaceutical treatments for patients with COVID-19.

DISCUSSIONS AND CONCLUSION

Preprints are preliminary results, or publications that have not yet been formally peer-reviewed, in academic journals.

Preprints have become an important piece of academic knowledge. During the pandemic.

There has been considerable growth in the number of preprints deposited during the COVID-19 pandemic. preprints on COVID-19 have outperformed preprints from other subject domains.

One in ten preprints published to the preprint server medRxiv in 2020 was related to COVID-19 (Else , nd) .

Preprints have also played an important role in disseminating and providing cutting-edge rapid access on the infectious disease COVID-19 to find pharmaceutical interventions through vaccines and pharmaceutical innovations.

This study has made an attempt to understand the COVID-19 preprint of Indian authors, exploring the Indian publication pattern related to COVID-19 through citations and bibliographic databases such as Web of Science , Scopus , PubMed , Dimensions .

This is the first study that has tried to look at India and its pattern of posting COVID-19 preprints on preprint servers. bioRxiv and medRxiv .

result found that almost 4.06% (1031 of 25416 (18869 medRxiv preprints and 6547 bioRxiv preprints) of the total COVID-19 preprints deposited in bioRxiv and medRxiv originated from India.

It was previously found that Indians were very reluctant to deposit their manuscript on preprint servers (only about 3.5%).

Research papers from India were deposited on preprint servers arXiv as found in the previous study (Singh et al., 2020).

In a span of almost three years there was considerable growth in the deposit of COVID-19 related preprints on preprint servers bioRxiv and medRxiv by Indian authors.

This should be maintained and encourage authors to submit their research papers to preprints before submitting them to academic journals for the formal review process.

In terms of publishing COVID-19 preprints under various copyrights and Creative Commons (CC9), it was found that although the largest number of preprints (42.58%) were published under CC BY-NC-ND 4.0 Licenses that allow copying and redistribution of the preprint in any medium or format, 32.30% of the Indian COVID-19 preprints were published under “All Rights Reserved”.

This copyright license restricts others from copying or redistributing these preprints in the open.

This calls to raise awareness about Creative Commons License and its broader benefits to society.

Preprints in the field of infectious diseases, excluding HIV/AIDS, represented almost 28% of all preprints , followed by Global Epidemiology with 22.89%.

This highlights India as a source of medical information, with researchers eager to share their infectious disease

Rank	Journal Name	No. of Preprints Published	2021 Journal Impact Factor	Subject Area (Journal Quartile Ranking)
1.	PLOS ONE	14	3.752	Multidisciplinary Sciences (Q2)
2.	Scientific Reports	10	4.997	Multidisciplinary Sciences (Q2)
3.	Infection, Genetics and Evolution	6	4.393	Infectious Diseases (Q2)
4.	International Journal of Infectious Diseases	6	12.073	Infectious Diseases (Q1)
5.	Frontiers in Immunology	5	8.787	Immunology (Q1)
6.	Journal of Family Medicine and Primary Care	5	-	Primary Health Care
7.	Virus Research	5	6.286	Virology (Q3)
8.	eLife	4	8.713	Biology (Q1)
9.	Frontiers in Genetics	4	4.772	Genetics & Heredity (Q2)
10.	Science of The Total Environment	4	10.754	Environmental Sciences (Q1)
11.	ACS Applied Bio Materials	3	-	Nanoscience & Nanotechnology; Materials Science, Biomaterials
12.	Clinical Infectious Diseases	3	20.999	Immunology (Q1)
13.	Disaster Medicine and Public Health Preparedness	3	5.556	Public, Environmental & Occupational Health (Q1)
14.	eBioMedicine	3	11.205	Medicine, Research & Experimental (Q1)
15.	Environmental Research	3	8.431	Environmental Sciences (Q1)
16.	Frontiers in Cellular and Infection Microbiology	3	6.073	Immunology (Q2) and microbiology (Q2)
17.	Frontiers in Public Health	3	6.461	Public, Environmental & Occupational Health (Q1)
18.	Journal of Biomolecular Structure and Dynamics	3	5.235	Biochemistry & Molecular Biology (Q1) and Biophysics (Q1)
19.	Journal of Infection	3	38.637	Infectious Diseases (Q1)
20.	Journal of Medical Virology	3	20.693	Virology (Q1)
21.	Microbial Pathogenesis	3	3.848	Immunology (Q3) and Microbiology (Q3)
22.	PLOS Computational Biology	3	4.779	Biochemical Research Methods (Q1) and Mathematical & Computational Biology (Q1)
23.	Vaccine	3	4.169	Immunology (Q3) and Medicine, Research & Experimental (Q3)
24.	Virology	3	3.513	Virology (Q3)

TABLE 1: JOURNALS PUBLISHED WITH 3 OR MORE INDIAN COVID-19 PREPRINTS

findings on preprint servers to educate the wider community.

Another important finding from this study is the collaborative nature of COVID-19 related services.

Only 5.43% of the preprints were single-author preprints, and almost 95% of the preprints were written by two or more authors.

This study found a quarter of the preprints were written by more than 11 authors.

This demonstrates the collaborative nature of posts related to COVID-19.

This collaboration has allowed some authors, such as Priya Abraham (16 preprints) and Madhvi Joshi and Samiran Panda (14 preprints each), to publish a high number of preprints during the pandemic.

These authors are associated with institutions like AIIMS Delhi, IISc Bengaluru and ICMR-NIV Pune.

This highlights the contribution of Indian institutions to the global medical research efforts.

However, it needs to be examined further in terms of the international collaboration pattern of the Indian authors. An important finding of the study is that 49.17% (118 of 240 preprints) of the COVID-19 preprints deposited in bioRxiv have been published in journals, compared to medRxiv

where 20.86% of preprints have been published in peer-reviewed journals.

Another interesting finding of the study is that a total of 173 journals have published 283 COVID-19 preprints.

Of these 173 journals, PLOS One has published the largest number of preprints (14 out of 283), followed by Scientific Reports with 10 preprints published in their journals.

Most of these journals have good impact factors and a high journal quartile ranking.

preprint server is the possibility of increasing the number of citations and online mentions in a short time (Fraser et al., 2020).

In this study it was also observed that in a short time many COVID-19 preprints have received a considerable number of citations.

Previous studies have also shown that preprints that were subsequently published in peer-reviewed journals have received more citations and mentions online compared to articles submitted directly to journals and subsequently published (Davis & Fromerth, 2006; Serghiou & Ioannidis, 2018). Submitting or depositing manuscripts on preprint servers has major benefits such as rapid peer-to-peer feedback, increased reach and visibility, and possible collaborative research.

This pandemic has shown how preprints have played an important role in provide prompt and open access to research results to mitigate the spread of COVID-19.

As this study showed, Indian authors have also adopted preprint servers to deposit their COVID-19 manuscripts in large numbers during this pandemic.

This has to be sustained, and those authors who deposit their preprints should be incentivized by the institutions to encourage them to make their publications and data open and to reap greater benefits from scientific openness.

CONCLUSION

The COVID-19 pandemic has created a pressing need to rapidly communicate research to the academic community. preprint servers are becoming an increasingly important platform for sharing preliminary research results.

These servers provide a way to spread ideas and directions for future research.

This is in line with UNESCO's mission to promote open science and collaboration between publishers and stakeholders to make research accessible to all.

The study found that Indian researchers have adopted preprint servers , such as bioRxiv and medRxiv , as a means of quickly communicating their findings with the broader community.

This is particularly important in the fight against the pandemic, where rapid and effective communication of the investigation is essential.

The study concludes that the active participation of Indian researchers in the use of preprint servers underscores the importance of open science in addressing critical global issues.

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