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Pro-Metrics

ORIGINAL ARTICLE

Impact of COVID-19 on Indian biomedical research: A bibliometric analysis using online da-ta from 2017 to 2022

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RESUMEN

Objective. The global pandemic caused by the SARS-CoV-2 virus has led to a notable surge in research productivity across many academic disciplines, except research specifically focused on the virus. A significant increase in published research articles evidences this. In this study, we have analyzed the impact of the pandemic on recent publication trends in India by comparing data from three years before the pandemic with data from three years following the pandemic. Additionally, we have considered various factors that may have influenced this change.

Methods. The Scopus database was searched for biomedical publications from January 1st, 2017, to December 31st, 2022, with India's country or territory specified as the limiting factor. The period was then divided into two parts: pre- and post-COVID-19. The pre-COVID-19 period spanned from 2017 to 2019, while the post-COVID-19 period spanned from 2020 to 2022. The publication trends in all subject areas across the periods above (pre- and post-COVID-19) were analyzed using appropriate nonparametric statistical tests and graphics.

Results. In the specified period, India produced 231,370 research documents, which exceeded that of Australia (214,750) and France (207,220). However, it was lower than that of the top-performing publishing countries. The United States (148,448), China (71,484), the United Kingdom (42,446), Germany (31,727), Italy (7183), Japan (251,357), and Canada (241,759) also demonstrated notable research output. The discrepancy in research output between the pre-and post-pandemic periods was statistically significant ($P < 0.001$; Wilcoxon rank sum test, $Z = 4.107$). The publication output from the top institutions was significantly higher ($P < 0.001$, Wilcoxon signed-rank test, $Z = 8.115$). The statistically significant increase persisted in subgroup analysis for public and privately funded medical institutions, including medical colleges ($P < 0.01$). However, no significant difference in the rise in publication output pre- vs. post-COVID was observed when public institutions, private institutions, and medical colleges were mutually compared ($P = 0.434$, Kruskal-Wallis test).

Conclusion. The global pandemic of the novel coronavirus (2019-nCoV) benefitted India's research output of biomedical disciplines. This effect was observed in public and privately funded medical institutions and academic centers. However, when the publication figures from these institutions were compared, no significant difference in the rise due to the 2019-nCoV pandemic was seen.

Keywords: COVID-19; SARS-COV-2; biomedical research; bibliometrics, scientific production, online data

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1. INTRODUCTION

The global impact of the Coronavirus Disease 2019 (COVID-19) pandemic was pervasive, extending to all facets of human existence. Scientific research was no exception to this phenomenon. In addition to its medical implications and devastating effects on the healthcare system, the pandemic significantly impacted various aspects of life, even in the most advanced countries (Greer *et al.,* 2020; Liu *et al.,* 2021; Park *et al.,* 2021). In addition to research on medications and vaccines for SARS-CoV-2, the search for solutions to ancillary issues and problems experienced by the health system (such as the acute crisis of ventilators and oxygen, the impact of the SARS-CoV-2 pandemic on medical education, as well as education in general, and clinical practice, among other areas) intensified markedly (Barello *et al.,* (2020; Delardas *et al.,* 2022; Fauzi, 2022; Haynes *et al.,* 2020; Jain *et al.,* 2021; Raynaud *et al.,* 2021; Upadhyaya *et al.,* 2020). Furthermore, the cessation of routine clinical duties, fieldwork, and laboratory experiments allowed researchers to complete their outstanding manuscripts and unpublished thesis work, among other tasks, and submit them for publication. Consequently, an alarming increase in research productivity across almost all knowledge fields was observed, with a considerable volume of manuscripts submitted for publication in research journals, even to the extent that editors of well-known international scientific journals found it challenging to keep pace with the influx (Forti *et al.,* 2020; Giannos *et al.,* 2022).

This study aims to analyze the impact of the Coronavirus Disease 2019 (COVID-19) pandemic on recent publication trends from India. To achieve this, data from three years before the pandemic and three years following its onset will be considered, along with various factors affecting these trends.

2. METHODS

2.1. Search strategy

To retrieve all published papers on medical sciences from SCOPUS, we employed the advanced search feature and the following search strategy: The search term "SUBJAREA" was entered with the subject area code "MEDI." Inputting "SUBJAREA (MEDI)" returns documents that have been classified under the subject area "Medicine." The following subject areas were classified under this heading:

- Medicine (all)
- Medicine (miscellaneous)
- Anatomy
- Anaesthesiology and Pain Medicine
- Cardiology and Cardiovascular Medicine
- Critical Care and Intensive Care Medicine
- Complementary and alternative medicine
- Dermatology
- Drug Guides
- Embryology
- Emergency Medicine
- Endocrinology, Diabetes and Metabolism
- Epidemiology
- Family Practice
- Gastroenterology
- Genetics (clinical)
- Geriatrics and Gerontology
- Health informatics
- Health Policy
- Hematology
- Hepatology
- Histology
- Immunology and Allergy
- Internal Medicine

The following subject areas were classified under "Infectious Disease-Microbiology (medical)". Additionally, the following disciplines are represented: perinatology and child health, pharmacology (medical), physiology (medical), psychiatry and mental health, public health, environmental and occupational health, pulmonary and respiratory medicine, radiology, nuclear medicine and imaging, rehabilitation, reproductive medicine, reviews and references (medical), rheumatology, surgery, transplantation, and urology.

Subsequently, the search was limited to January 1st, 2017, and December 31st, 2022, with the geographic scope restricted to India. The period was then divided into the pre-Covid-19 period (2017-2019) and the post-Covid-19 period (2020-2022). The publication trends in all subject areas across the specified periods (pre- and post-COVID-19) were analyzed separately using a graphical approach. The present

analysis focuses on recent publication trends, considering data from three years before the onset of the pandemic and three years following its conclusion.

2.2. Statistical analysis

The data regarding the top authors, institutions, and journals in which the papers were published and the citation data were extracted from the SCOPUS database. The relevant graphics were generated using LibreOffice for Mac OSX, version 7.3.7.2. The numerical data were summarized as the mean (standard deviation or SD) when the distribution was normal and as the median (range, inter-quartile range, or IQR) otherwise. Categorical data were summarized as numbers (percentage). Additionally, a statistical comparison was performed of publication data from the pre- and post-COVID periods for the top authors, institutions, and journals, as well as a comparison of citation trends. The normality assumption was verified by utilizing the Shapiro-Wilk test, and the numerical data were contrasted utilizing Student's t-test in instances where the assumption was validated and the Wilcoxon Rank-Sum test in cases where it was not. A paired t-test or Wilcoxon signed-rank test was employed to analyze matched data (e.g., the output for the top institutions in the pre- and post-COVID periods). In instances where three or more groups were involved (e.g., public institutions vs. those from privately funded academic centers and private non-teaching institutions/hospitals), an ANOVA or Kruskal-Wallis test was conducted, followed by applying suitable post hoc comparisons, if necessary. Categorical data were compared using the Chi-square test or Fisher's exact test, as appropriate. A p-value of less than 0.05 was considered statistically significant.

3. RESULTS

3.1 Search outcomes

The preliminary search of the Scopus database for literature about medicine yielded 28,071,657 documents spanning the years 1865 to 2022. Limiting the search to the period between 2017 and 2022 reduced the number of remaining documents to 543,534. Upon restricting the search to the country or territory of India, the number of documents remaining was 231,370, representing 4.26% of the global total.

3.2. Comparison of research output from India to that from other prominent countries

The number of research documents produced in India during the 2017-2022 period was 231,370, higher than that of Australia (214,750) and France (207,220). However, it was lower than that of the top-performing publishing countries. The United States (148,448), China (71,484), the United Kingdom (42,446), Germany (31,727), Italy (7183), Japan (251,357), and Canada (241,759) also demonstrated notable output. The output was higher in the post-Covid period than in the pre-Covid period. However, India exhibited a distinctive production peak similar to that observed in China and Italy. A statistically significant difference ($P < 0.001$) was observed in research output between the pre-and post-pandemic periods. The Wilcoxon rank-sum test yielded a Z-value of 4.107. The resulting output is illustrated in Figure 1.

3.3. Publication Output from India

The number of papers published from India has increased markedly over the past five years, from 27,632 in 2017 to 50,861 in 2022. This growth is particularly evident between 2019 and 2020 when the number of papers published in India increased from 34,164 to 40,290 (Figure 2). A comparable surge was documented for Italy and China, as illustrated in Figure 1.

A comparison of data from the pre-and post-COVID-19 periods revealed a significant increase in the number of papers published by Indian authors in the Scopus database. In the pre-COVID period (2017-19), 927,430 papers were published, while in the post-COVID period (2020-22), this number increased to 1,393,760, representing a 52.28% growth.

3.4. Authors

A comparative analysis was conducted on data from 159 leading authors in India, encompassing the pre- and post-pandemic periods. The

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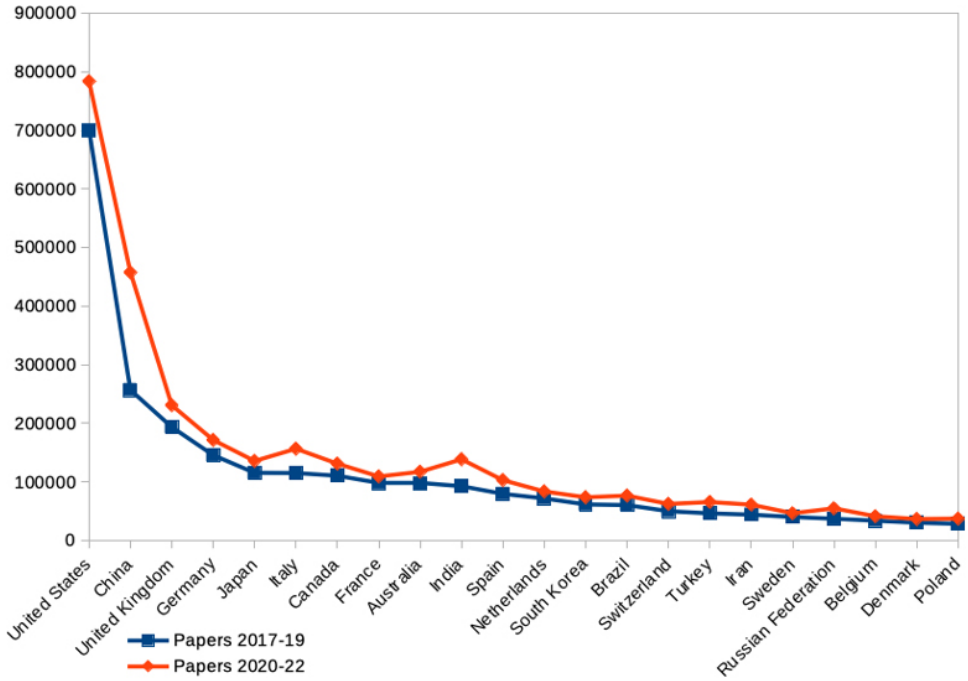

Figure 1. Productivity per country during the period 2017-2022.

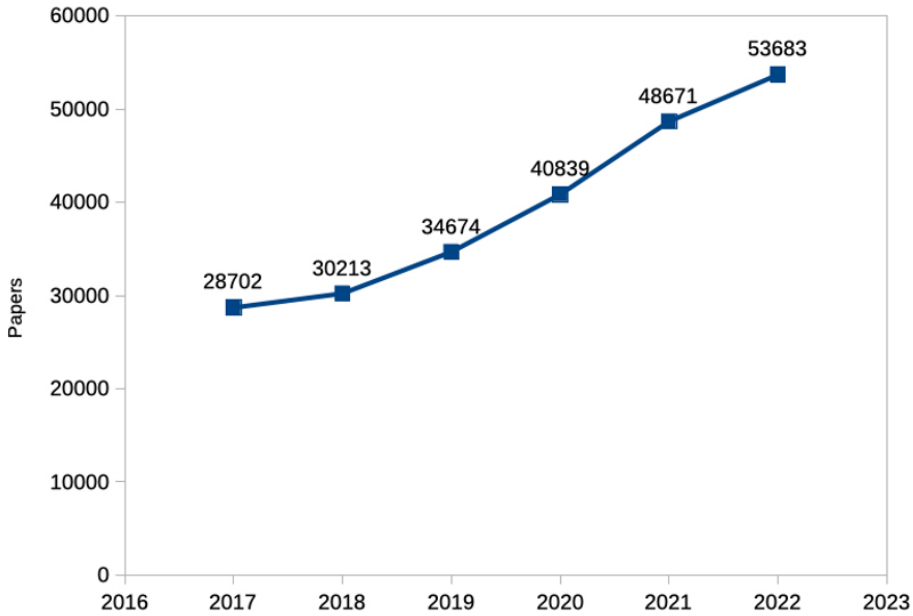

Figure 2. Publication output from India in the period 2017-2022.

median number of publications was 66 (range 55 to 252; IQR 21.5), representing an increase to 95 publications (range 77 to 812; IQR 31.5). This was a statistically significant increase, with a p-value of less than 0.001 (Wilcoxon rank sum test, Z=10.937). Figure 3 illustrates the trends in the number of papers by the top 159 authors. In the pre-covid period, the top three Indian authors were Kalra, S. *et al.* (252 publications), Wiwanitkit, V. *et al.* (205 publications), and Shrivastava, P.S. *et al.* (156 publications). In contrast, in the post-covid period, the top authors were Wiwanitkit, V. *et al.* (812 publications), Mungmunpuntipantip, R. *et al.* (354 publications), and Kalra, S. *et al.* (216 publications).

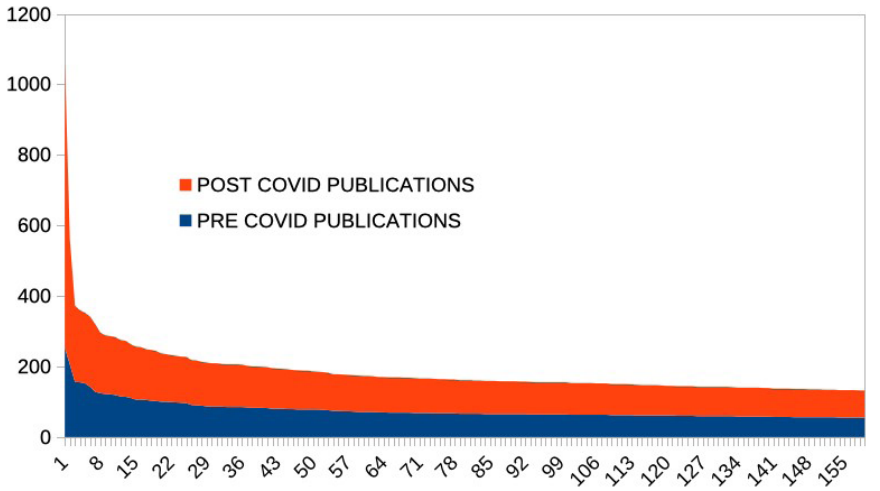

Figure 3. Publication output by Indian authors in the pre-COVID (2017-2019) and post-COVID (2029-2022) periods.

3.5. Institutions

The data from the top 25 institutions in India that contributed to publications in the field of medicine during the specified periods were subjected to analysis. The data was manually arranged in pairwise comparisons between the pre- and post-pandemic periods for this analysis. The median number of publications in 2017-2019 was 820 (range 560 to 5581; IQR 489), while the median number of publications in the subsequent period was 1344 (range 364 to 8128; IQR 1002). In the pre-pandemic period, the top three Indian institutions were the All India Institute of Medical Sciences (AIIMS) in New Delhi (5,581 publications), the Post Graduate Institute of Medical Education & Research (PGIMER) in Chandigarh (4,399 publications), and Manipal Academy of Higher Education (MAHE) in Manipal (2,279 publications). In the post-Covid period, the top institutions were AIIMS, New Delhi (8,128 publications), PGIMER, Chandigarh (6,259 publications), and MAHE (3,401 publications), respectively (Figure 4). The observed increase in institution publication output was statistically significant (Wilcoxon signed-rank test, $W = 11$, $Z = 4.624$, $P < 0.01$).

3.6. Public vs. Private Institutions

A total of 25 institutions were included in the analysis, of which 15 were government-affiliated and ten were privately funded. In the pre-pandemic period, the top three government/public institutions were AIIMS, New Delhi (5,581 publications), PGIMER, Chandigarh (4,399 publications), and Sanjay Gandhi Post Graduate Institute (SGPGI), Lucknow (1,464 publications). The top three private institutions were MAHE, Manipal (2,279 publications), Christian Medical College (CMC), Vellore (1,488 publications), and Dr. D. Y. Patil Vidyapeeth, Pune (393 publications). In the post-pandemic period, the top three private institutions were MAHE, Manipal (3,401 publications), CMC, Vellore (2,067 publications) and Dr. D. Y. Patil Vidyapeeth, Pune (1881 publications). In contrast, the top three public institutions were AIIMS, New Delhi (8,128 publications), PGIMER, Chandigarh (6,259 publications), and TMH, Mumbai (2,151 publications).

In the period preceding the implementation of the measures to control the spread of the virus, the median number of publications from the top 15 government institutions was 820 (range 634 to 581; interquartile range [IQR] 521.5), while the median number of publications from the top 10 private institutions was 822 (range 560 to 2279; IQR 541.25). The difference between these two medians was insignificant ($P = 0.495$, Mann-Whitney U test, $W = 88$).

Similarly, in the post-covid period, the median number of publications from the top 15 government institutions was 1407 (range 713 to 8128; IQR 841), while the median number of publications from the top 10 private institutions

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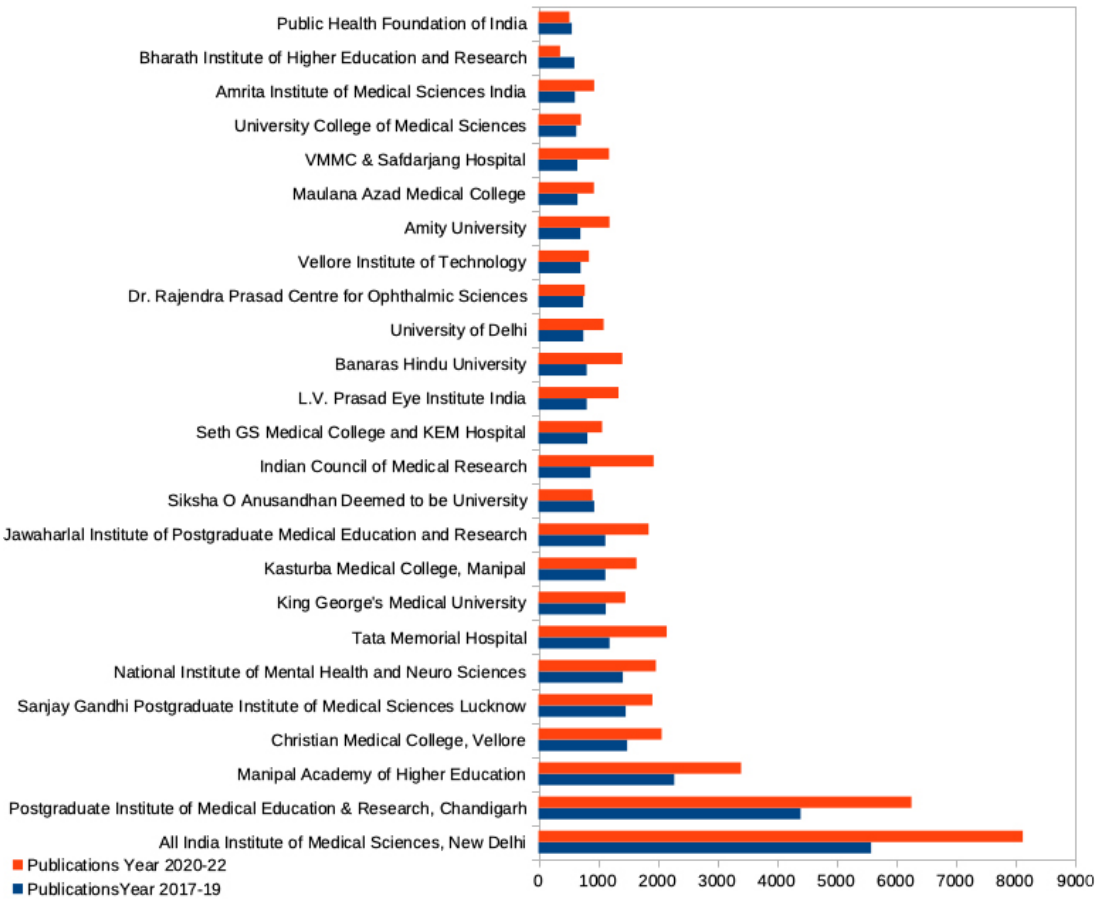

Figure 4. Publication output by Indian Institutions in the pre-COVID (2017-19) and post-COVID-19 (2000-2022) periods.

was 1064 (range 364 to 3401; IQR 1099). The difference between these two medians was insignificant (P= 0.461, Mann Whitney U test, W= 89).

The median increase in publications from the top 15 government institutions was 533 (range 27 to 2547, IQR 360.5), while the median rise from the top 10 private institutions was 406 (range -239 to 1122; IQR 552). The difference between the two groups was insignificant (P= 0.285, Mann Whitney U test, W= 95) (Figure 5A).

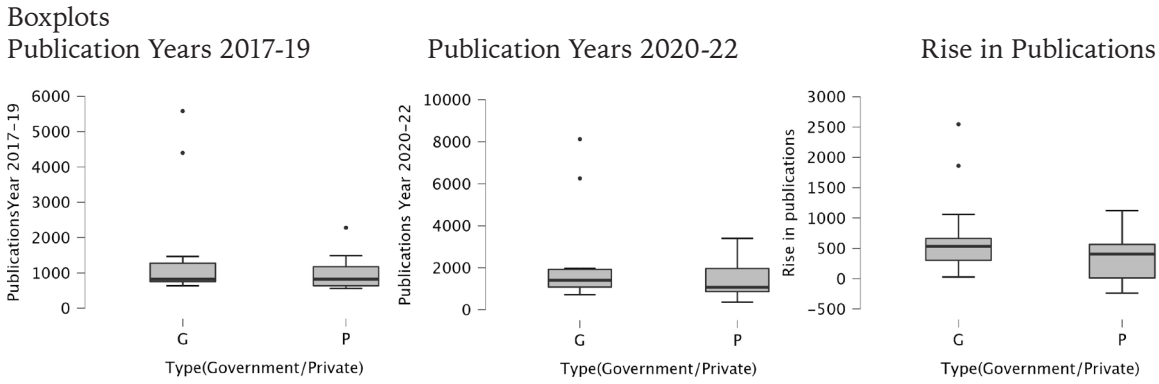

Figure 5A. Publication output by Indian public vs. private institutions in the pre-COVID (2017-19) and COVID (2029-22) periods.

3.7. Comparing Public institutions with Private academic institutions and Private hospitals

We conducted a more detailed examination and comparison of the publication output from public institutions versus those from privately funded academic centers and private non-teaching institutions/hospitals. To this end, the data for the pre-and post-pandemic periods, extracted from SCOPUS, were manually arranged for the top 92 institutions and subdivided into three categories (60 public institutions, 34 privately funded academic centers, and eight private non-teaching institutions/hospitals) to study the changes in publication output over time (Table 1).

S. No.	Name of the Institute	Post Covid Publications	Pre Covid Publications	Current Total Citations
	Publication metrics for top 8 public institutions			
1	All India Institute of Medical Sciences, New Delhi	8543	5820	139169
2	Postgraduate Institute of Medical Education & Research, Chandigarh	6232	4399	113739
3	Tata Memorial Hospital, Mumbai	2151	1193	55493
4	National Institute of Mental Health and Neuro Sciences, Bangalore	1965	1416	26089
5	Indian Council of Medical Research< New Delhi	1920	873	75754
6	Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow	1913	1468	68676
7	Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry	1844	1122	18154
8	Ministry of Health and Family Welfare, New Delhi	1791	265	22303
8*	All India Institute of Medical Sciences, Rishikesh	1643	333	12090
	Publication metrics of top 8 private medical colleges			
1	Manipal Academy of Higher Education, Manipal	4129	3914	665522
2	Christian Medical College, Vellore	2067	1487	64301
3	Dr. D. Y. Patil Vidyapeeth, Pune	1881	393	33871
4	Kasturba Medical College, Manipal	1645	1636	14886
5	Saveetha Institute of Medical and Technical Sciences, Chennai	1238	447	10576
6	Amity University, Multi city locations	1189	704	18562
7	Datta Meghe Institute of Higher Education & Research Deemed to be University, Wardha	1150	315	16196
8	JSS Academy of Higher Education & Research, Mysore	1054	275	45163
	Publication metrics for top 8 private hospitals			
1	Apollo Hospitals, Multi city locations	897	579	19088
2	Aravind Eye Hospitals, Multi city locations	725	293	4548
3	Sir Ganga Ram Hospital, New Delhi	707	504	15243
4	Sankara Nethralaya, Chennai	549	372	6537
5	Fortis Healthcare Ltd., Multi city locations	473	394	21371
6	Medanta - The Medicity, Gurugram	472	293	9273
7	P.D. Hinduja National Hospital and Medical Research Centre, Mumbai	411	266	7467
8	Rajiv Gandhi Cancer Institute and Research Centre, Delhi	364	250	3561

Table 1. Publication metrics for the top 8 public and private academic institutions and hospitals.

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The data revealed a markedly elevated publication output from the leading institutions (Figure 5B; P < 0.001, Wilcoxon signed-rank test, Z = 8.115). A detailed bibliometric analysis of the top eight institutions in each category is presented in Table 1.

The statistically significant rise was observed to persist in the subgroup analysis for public institutions (P < 0.001, Wilcoxon signed-rank test), privately funded medical institutions, including medical colleges (P < 0.001, Wilcoxon signed-rank test), as well as for private hospitals (P = 0.008, Wilcoxon signed-rank test). However, no significant difference in the rise in publication output between the pre-and post-covid periods was identified when the three subgroups of public institutions, private academic institutions, and private hospitals were mutually compared (P = 0.434, Kruskal-Wallis test) (Figures 5C and 5D).

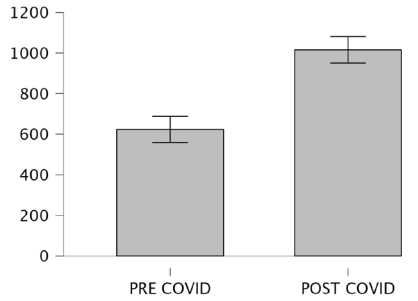

Figure 5B. Overall rise in publications from top 92 institutions (pre-COVID and post-COVID period).

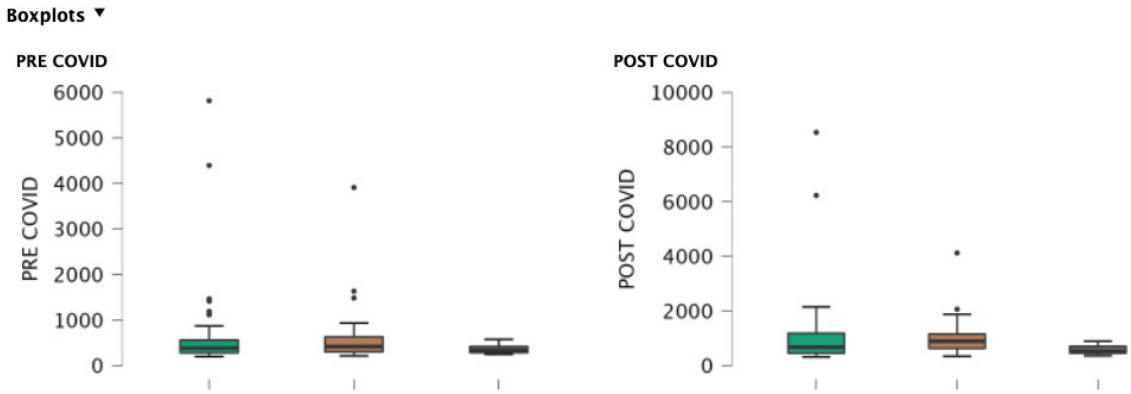

Figure 5C. Box and whisker plots for publications for various institutions (Government, Private academic institutions, Private Hospitals-black) pre-COVID and post-COVID periods.

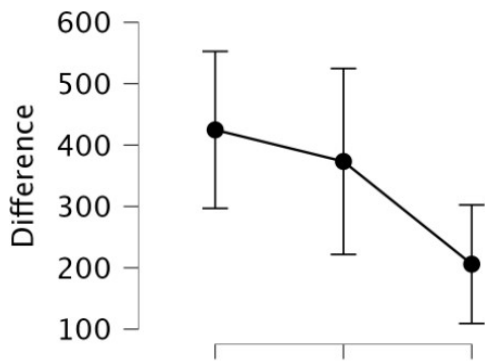

Figure 5D. Rise in publications vs. type of institution (government, private academic institutions, and private hospitals).

3.8. Journals

The Indian authors published their research in 141 of the top journals in their field. The median number of publications was 199 (range 98 to 3517; IQR 156), increasing to 298 (range 177 to 2849; IQR 225). This was a statistically significant increase (P < 0.001; Wilcoxon rank sum test, W = 5423.5). Figure 6 illustrates the evolution of the number of papers cited by the top 10 journals. The three journals with the highest number of publications by Indian authors in the pre-pandemic period were the Indian Journal of Public Health Research and Development (3,517 publications), the Research Journal of Pharmacy and Technology (1,741 publications), and the Asian Journal of Pharmaceutical and Clinical Research (1,688 publications). In the post-pandemic period, the three journals with the highest number of publications by Indian authors were the Indian Journal of Ophthalmology (2,849 publications), the Research Journal of Pharmacy and Technology (1,960 publications), and BMJ Case Reports (1,543 publications).

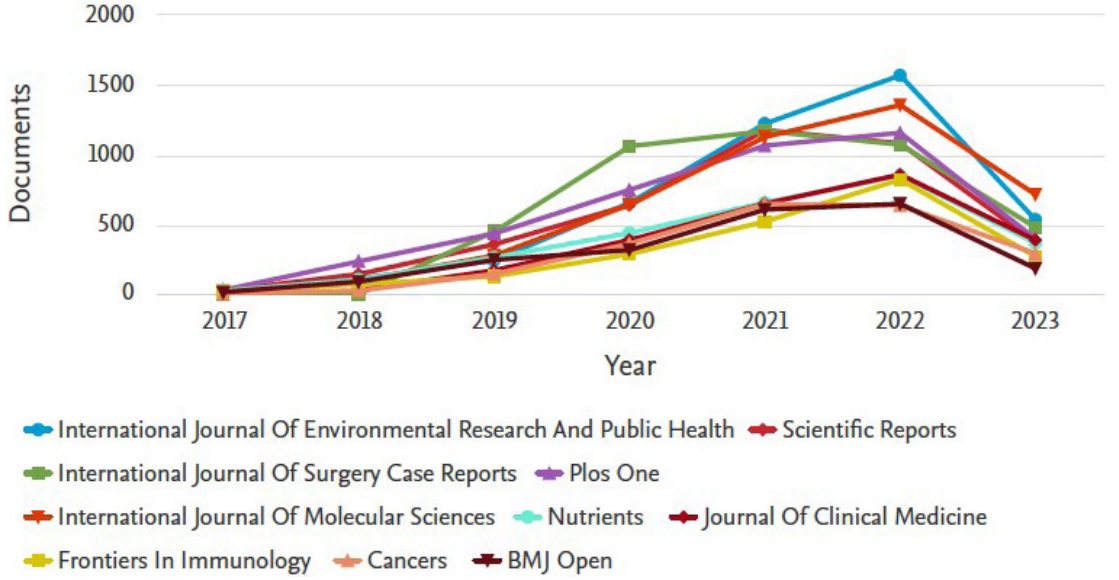

Figure 6. Trends for the top 10 international journals citing the top papers in the year range 2017-2023.

4. DISCUSSION

It was observed that the global pandemic caused by the novel coronavirus (2019-nCoV) significantly impacted the publication patterns of biomedical research from India, as it did worldwide. This effect was evident in research articles related to the pandemic and those unrelated to it. A 52.28% increase was observed in the post-pandemic period compared to the pre-pandemic period. However, India's global contribution to biomedical research publication between 2017 and 2022 was only 4.26%, indicating a significant opportunity for growth in the coming years. The increase in the number of publications before and after the onset of the pandemic affected all of the top authors, but the rankings of these authors were affected in different ways. For example, the author who was the top author in the period preceding the pandemic, Kalra, S. *et al.*, became the third author during the pandemic. A comparable phenomenon was observed in the publication output of various institutions, including both public and private entities. While the overall production increased, the ranking sequence transformed. Notably, the top three positions were consistently maintained by AIIMS, Delhi; PGIMER, Chandigarh; and MAHE, Manipal, for both the pre and post-pandemic periods. Concerning public institutions, the third-ranked institution before the pandemic was the SGPGI in Lucknow, with 1,464 publications. However, this position was assumed by TMH, Mumbai with 2,151 publications, in the post-pandemic period. To illustrate further, the Apollo Hospitals group contributed 579 papers in the pre-pandemic period (rank 25), which increased to 897 documents in the post-pandemic period (rank 32). In contrast, Sir Ganga Ram Hospital, Delhi, contributed 504 publications in the pre-pandemic period (rank 33), which increased to 707 publications in the post-pandemic period (rank 47).

Prior bibliometric analyses have indicated the necessity of focusing on the structure of publication types, their scientific standards, and quality control, given the rising number of SARS-CoV-2-related and non-SARS-CoV-2-related publications. Additionally, several healthcare journals have observed a compression effect of coronavirus-related articles against non-coronavirus articles (He *et al.*, 2023).

The increase in the number of publications related to the novel coronavirus (SARS-CoV-2) has the potential to significantly influence the journal impact factors (JIFs) released annually by Clarivate Analytics (Journal Citation Reports, 2021). The JIF is a metric that quantifies the relative impact of a journal based on the ratio of citations received in a given year to the number of citable documents published in the journal during the two preceding years, divided by the number of citable items published in

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that journal over the two previous years. This metric is frequently employed to measure a research journal's impact or, indirectly, its value. The abrupt increase in the JIF of The Lancet from 79.323 in 2020 to 202.731 in 2021 has been attributed to a surge in highly cited papers related to the novel coronavirus (He *et al.,* 2023; Journal Citation Reports, 2021).

Prior bibliometric research on publications related to the Coronavirus Disease 2019 (COVID-19) has been conducted in other countries and continents, including Africa and India (Kulkarni *et al.,* 2022; Saad *et al.,* 2022; Tonen-Wolyec *et al.,* 2022). However, to the best of our knowledge, no prior research has analyzed the global impact of the pandemic on overall publication output. Some countries, such as South Korea, have published analyses of the effects of the pandemic on journal impact (Park *et al.,* 2022). Previous authors have analyzed the effects of the SARS-CoV-2 pandemic on non-SARS-CoV-2-related research (Raynaud *et al.,* 2021). Previously, bibliometric studies have been published exploring the impact factors of journals without any publications related to the Coronavirus Disease 2019 (COVID-19) pandemic. Additionally, previous studies have evaluated the impact of the pandemic on the number of non-Covid-19 papers in various fields, including clinical research, pathology, ophthalmology, and dermatology (González-Hermosillo *et al.,* 2022; Jin *et al.,* 2021; Kaur *et al.,* 2022; Strobl *et al.,* 2021).

Prior research has also identified a notable increase in publications and citations associated with the emergence of the Coronavirus Disease 2019 (COVID-19) pandemic. This exponential growth in scientific literature has been described as the "greatest explosion of scientific literature ever in science." This phenomenon has been particularly pronounced in global health journals, where it has been regarded as a "hot feature of a pandemic." In light of the considerable volume of research papers on the novel coronavirus, in addition to those on other topics, there have been several attempts to utilize artificial intelligence (AI) technologies to identify the most pertinent research and provide a means of synthesizing it. Additionally, the high citation rates of numerous papers on the novel coronavirus have significantly elevated the impact factors of several journals, including well-established ones that previously had already attained high impact factors. This has further attracted more manuscript submissions, increased international prestige, and financial advantages such as more funding. It was further proposed that in the event of a future pandemic, journals may wish to consider balancing the publication structure and the relative quantities of pandemic and non-pandemic-related publications (Brainard, 2020; Beranová *et al.,* 2022; Cai *et al.,* 2021; He *et al.,* 2023).

It is also crucial to acknowledge the impact of innovative technologies such as data, machine learning, the Internet of Things (IoT), and artificial intelligence (AI) in combating emerging diseases in the current global context, particularly in the context of the ongoing Coronavirus Disease 2019 (Covid-19) pandemic. A comprehensive review of the literature has identified seven critical applications of AI in this regard, including the detection, monitoring, and treatment of patients, contact tracing, forecasting the incidence and mortality of cases, the development of vaccines and drugs, and the reduction of the burden on healthcare professionals and disease prevention (Vaishya *et al.,* 2020). In addition, instead of placing undue reliance on absolute numbers, alternatives such as the positivity rate of tests have been proposed, and it is similarly recommended that publication metrics be subjected to similar scrutiny (Kambhampati & Vaishya, 2020). To make an accurate assessment, it is essential to consider the quality of the manuscripts published in this era rather than relying solely on publication and citation numbers. Previous bibliometric analyses have concentrated on the most cited studies published on the 2019 novel coronavirus (2019-nCoV), including the number of citations received and the total number of publications during the pandemic.

Additionally, there have been analyses of the marked surge in publications related to the novel coronavirus during the first three months of the pandemic, which saw nearly 59 articles published daily on the novel coronavirus. However, these analyses do not compare all publications during the pandemic with the top publications or their citations during the period preceding the pandemic (Kambhampati *et al.,* 2021; Vaishya & Vaish, 2020).

Nundy *et al*. conducted a comprehensive analysis of research output from Indian medical institutions, encompassing both public and private institutions, between 2005 and 2014. However, the study was primarily focused on the relative ranking of institutions rather than on the factors influencing them or the trends of publications (Ray *et al*., 2016). This is the first study to analyze the publication output from Indian medical institutions over the past six years, including examining the impact of the SARS-CoV-2 pandemic on this output. The study also presents a subgroup analysis of publicly funded institutions, private medical colleges, and private hospitals, in addition to their ranking.

Limitations and Strengths of the Study

It is acknowledged that the study has limitations. Firstly, our analysis focused on the top publications from India as reported in the Scopus database. Analysis of other databases, such as Web of Science (WoS), might yield different results. Furthermore, it should be noted that numerous authors may have contributed to non-indexed journals, which are not included in the present analysis. As the number of publications and citations change over time, it is reasonable to expect that subsequent citations will accumulate. To further track the follow-up impact, conducting a similar research project that includes more years of data would be beneficial.

Secondly, all biomedical and medical-related publications were considered together in this study. Since publication priorities and preferences may vary considerably across different subjects, including journals from disparate subjects by the same or different publishers could influence the results. The objective of the present analysis was to elucidate the impact of the SARS-CoV-2 pandemic on biomedical research publications in general, focusing on the differences in the pattern observed between public and private institutions in India. Consequently, future analyses may be conducted on separate subject areas and/or their mutual comparison.

To the best of our knowledge, no similar study has been published previously. This study's findings are anticipated to offer insights into the trends in publications from India from the perspectives of authors and institutions. Moreover, the findings assist institutions in preparing for future enhancements to their research output. Engaging in strategic planning to promote research productivity across all healthcare sectors would benefit healthcare administrators and policymakers in India.

5. CONCLUSION

The global pandemic caused by the SARS-CoV-2 virus profoundly impacted biomedical research in India, with a notable surge in the number of published research articles. This phenomenon was observed across a range of research institutions, including those funded by the government and private sources and academic centers. Nevertheless, no notable discrepancy in the increase in publication figures attributable to the impact of the pandemic was observed when public and privately funded institutions and medical colleges were compared. ●

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