Covid-19 and Infertility: A Scientometric Assessment of Global Publications

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ABSTRACT

The paper analyses Covid-19 and Infertility: A Scientometric Assessment of Global Publications. A scientometric analysis of the publications data for the study was sourced from the Scopus database covering the COVID-19 and infertility research publications during 2019 and 2021 with 10700 research publications and 210744 citations. Maximum growth of 9168(85.68%) research publications are contributed in the year 2021, followed by 1530(14.30%) publications in the year 2020, and 2(0.02) publications in the year 2019. Countries a maximum of 3367(38.45%) contributions are from the United States, the citations are 106966(43.73%), CPP is 31.77, H- index is 145 and RCI is 1.14. The study subjects a maximum of 1605(63.06%) contributions are Biochemistry, Genetics, and Molecular Biology. The author's maximum of 70(17.41%) contributions is Baden, L.R., and the United States. In the document type, a maximum of 5971(55.80%) research publications are contributed by articles. A maximum keyword, Human is with 9230(14.91%) research publications. The study Institution with a maximum of 221(15.04%) contributions is the Harvard Medical School. The keyword, the maximum of 348(17.92%) contributions is Vaccines. The maximum funding agency is the National Institutes of Health with 672(26.37%) research publications. The highly cited paper has the highest citations 4582, and document type of articles, Polack, F.P., et al (2020) Safety and efficacy of the BNT162b2 mRNA Covid-19 vaccine, New England Journal of Medicine, 383(27): 2603-2615.

KEYWORDS: Covid-19 and Infertility, Scientometric, Related citations index, Vaccine.

INTRODUCTION

In late 2019, numerous cases of pneumonia caused by a novel coronavirus (SARS-CoV-2) were reported in Wuhan city in China.[1] Subsequently, the infection has spread worldwide causing acute respiratory distress syndrome (SARS) termed "COVID-19" by the World Health Organization (WHO). The quick spread of this novel virus all over the world caused the declaration of a pandemic by the WHO leading to massive changes in social behaviors.[1] COVID-19 has had a disturbing impact on many of those suffering from the condition. It also had a significant impact on healthcare delivery for all patients without COVID-19.

Signs of SARS-CoV-2 infection include cough, shortness of breath, fever, fatigue, headache, sputum production, and myalgia. Additionally, patients reported gastrointestinal symptoms or anosmia.[2] The rigorousness of infection varies from presymptomatic cases to asymptomatic cases, to a flu-like disease, to serious illness and death. Patients in critical condition may suffer from respiratory failure, shock, or multiorgan dysfunctions. About 75% to 80% of COVID-19 infections are mild with only flu-like symptoms, 15% to 20% of infections are severe, requiring hospitalization for supplemental oxygen, and 5% of those are critical, requiring mechanical ventilation.[3] The risk factors for the fatal illness include age and underlying medical conditions such as diabetes, chronic respiratory disease, cardiovascular disease, hypertension, and cancer.[4] Fatality accounted for up to 3% of infections and commonly occurs in individuals over the age of 60 or those with underlying medical conditions. However, it also can affect younger persons, possibly related to the inoculum.

The role of SARS-CoV-2 infection in the human male reproductive system has yet to be fully understood. Therefore, the aim of this review is to highlight what is currently known about the effect of the novel SARS-CoV-2 infection on the male reproductive system.[5]

SCIENTOMETRICS

Scientometrics is an analysis of scientific research publications. Scientometrics analysis has been used to measure the scientific literature published online or offline through scientometrics techniques and statistical tools. In the late 1960s, Alan Prichard coined the term bibliometric, which is used for the application of mathematical and statistical methods for books and other media of communication **(Pritchard, 1969)[6]**. According to **Beck (1978)[7]** "Scientometrics is defined as the quantitative evaluation and inter-comparison of scientific activity, productivity, and progress". **Bookstein (1995)[8]** defined "scientometrics as the science of measuring science. Scientometrics is also considered as a bibliometric measurement for evaluation of scientific development, social relevance and impact of the application of science and technology". **Ingwerson and Christensen (1997)[9]** defined the term "informatics designates a recent extension of the traditional bibliometric analysis, also to cover non-scholarly communities in which information is produced, communicated and used". It is one of the most important measures for the assessment of scientific productions. "It involves quantitative studies of scientific activities including among other publications, so overlaps bibliometric to some extent" **(Tague-sutcliffffe 1992)[10]** It offers a set of measures for studying the structure and process of scholarly communication **(Subramanian 1983)[11]** "It is defined as the study and measurement of publication pattern of all forms of written communication and their authorship in a given area of research" **(Sengupta-1985)[12]** The present study aims to analyze the trend and characteristics of various bibliometric aspects of cloud computing technology research publications

REVIEW OF LITERATURE

Sandeep Grover et.al. (2021)[13] Impact of Covid-19 on Mental Health: A Bibliometric Assessment of Publications from India. The search showed that since the onset of the pandemic up to the 24th of April 2021, 1210 publications emerged from India, amounting to a 6.87% share of the global output on the topic and averaging 5.97 citations per paper. India stood at 5th position in terms of the number of publications on mental health, with the highest number of publications emerging from the United States (26.9%), About one-third (30.91%) of the publications involved international collaborations, with a maximum number of collaborations being with the United States, The most

common keywords in the research included, 'mental health, The research output came from 478 organizations, with maximum research coming from the National Institute of Mental Health and Neuro Sciences (NIMHANS), Bangalore, Five out of the 10 most productive authors.

BM Gupta et al. (2021)[14] Covid-19 and Heart Diseases: A Scientometric Assessment of Global Publications during 2020-21. A total of 5298 relevant publications indexed in the Scopus database were obtained on "Covid-19 and Heart Disease", which received 62459 citations, averaging 11.79 citations per paper. The total publications witnessed the participation of 123 countries, with USA, Italy, U.K., and China leading in global publication productivity leading in citation impact per publication and relative citation index. The 1761 organizations and 2499 authors participated in these 5298 publications. Harvard Medical School, USA, Brigham and Women's Hospital, USA, and Massachusetts General Hospital leads in publications productivity. European Heart Journal, Circulation, and Stroke leads in publication productivity (with 85, 81, and 73 publications), and JAMA Cardiology (154.23), Journal of the American College of Cardiology (54.99), and Circulation (43.54) lead in citation impact per paper.

Sandeep Grover et al. (2021)[15] Bibliometric Study of Publications on Impact of Covid-19 and Sleep Disorders. The global publications on this theme averaged 15.05 citations per paper. About 19.02% share of its total publications on this theme received external funding support and averaged 34.59 citations per paper. The USA, China, and Italy led in global publications ranking and productivity as against China (2.52), the U.K. (2.26), and Italy (1.67) leading in terms of relative citation index. The 527 organizations and 773 authors participated in global research on this theme, with the top 15 most productive organizations and authors contributing to 21.62% and 6.28% global publications share and 63.70% and 56.20% global citations share. Huazhong University of Science & Technology, Z. Liu, S. Grover, and G. Wang were the most productive authors. International Journal of Environment Research & Public Health, Sleep Medicine, and Frontiers in Psychiatry were the most productive journal.

Devi Dayal et al. (2021)[16] Covid-19 and Thyroid: A Scopus-based Bibliometric Assessment of Research Output. The global publications total of 599; 446 (74.4%) were original articles. Only 18.0% (108) were funded, but these received higher citations per paper (CPP) than the non-funded publications (average CPP 14.8 versus 9.8). Of the 97 countries that participated in the research, the USA, Italy, India, and China were the most productive, whereas China, Germany, the UK, and the USA were the most impactful. The research organizations and authors numbered 272 and 404, respectively. The most productive organizations were Universita Degli Studi Napoli, Italy, Harvard Medical School, USA, and Universita Degli Studi Milano, Italy. The most productive authors were G. Troncone, L. Glovanella, and G. Anedda. The top productive journals were Endocrine, Journal of Endocrine Investigation, and Frontiers in Endocrinology. Only 22 (3.6%) were highly cited (average CPP 141.8)

Surulinathi et al. (2021)[17] Global Publications on Covid-19 and Neurosciences: A Bibliometric Assessment during 2020-21. The 5245 global publications were published on 'Covid-19 and Neurosciences" as covered in the Scopus database and they have received 5245 citations, averaging 13.46 citations per paper. Of these 5245 publications, 24.54% (1287) received external funding support from 150+ agencies and averaged 20.17 citations per paper. 160 countries participated in global research on this topic, with USA, U.K., and Italy contributing the largest publication share (26.43%, 12.14%, and 10.51%) and China (23.8 and 1.78), Spain (9.13 and 0.68) and Italy (8.56 and 0.64) registering the highest citation impact, based on citations per paper and relative citation index. "Adults", among

population age groups, contributed the largest share (30.31%), "Stroke", "Multiple Sclerosis" and "Headache" among types of neurological diseases impacted by Covid-19.

Devi Dayal et al. (2021)[18] Covid-19 and Vitamin D Deficiency: A Scientometric Assessment of Global Publications during 2020-21. Of 435 global publications on VDD in Covid-19, 187 (42.9%) were original articles. The total and average citations per paper (CPP) were 5664 and 13.0, respectively. Eighty-eight (20.2%) publications were funded; the National Institute of Health, USA, was the leading funding agency (n=18). Seventy-four countries participated in research on this theme; the USA and Italy with 18.3% and 16.5% led in productivity, whereas Ireland and the USA were the most impactful. The most dominant research topic was "Risk Factors" with a 29.6% share. The organizations and authors numbered 254 and 383, the top productive authors, and Grant (USA) and Laird (Ireland) were the most influential. Journal of Medical Virology and Endocrine lead productivity while Aging Clinical and Experimental Research and Diabetes and Metabolic Syndrome.

Kanu Chakraborty et al. (2021)[19] Ophthalmic Manifestations of Covid-19: A Bibliometric Assessment of Global Scientific Literature. A total of 3453 publications were published on "Ophthalmic Manifestations of Covid-19", which received 32935 citations, averaging 9.54 citations per paper. Of the total publications, 557 received external funding support and registered 10802 citations. The U.S.A. and India published the most significant number of papers among countries. The U.S.A. and U.K. occupied the top position in international collaborative publications. Medicine and Neurosciences were the most productive areas. The Indian Journal of Ophthalmology is the most productive source. A total of 46 high-cited papers have been identified on this topic, which is published in 35 journals, with the U.S.A. contributing the most papers.

BM Gupta and KK Mueen Ahmed (2021)[20] COVID-2019 Vaccine a Scientometric Assessment of Global Publications during 2020 Among the top 12 countries, the USA, the U.K, and China were the most productive, and China, South Korea, and the USA were the most impactful. Nearly 51% of publications in these top 12 countries were international collaborative. The top most productive organizations were Harvard Medical School, USA (12 papers), University of Washington, Seattle, USA (10 papers), and Fudan University, China (with 12, 10, and 8 papers. The topmost impactful organizations in terms of citation per paper and relative citation index were Tongji Medical College, China (56.0 and 7.28), Shanghai Medical College, China (33.2 and 4.32), and the Chinese Center for Disease Control and Prevention, China (23.5 and 3.06). The most productive journals were Nature, Science, and Vaccine (24, 18, and 18 papers each), and the most impactful journals in terms of citations per paper were: Journal of Medical Virology (66.5), Cell (27.2), and New England Journal of Medicine (23.4)

Ravichandran.S and Vivekanandhan.S (2022)[21] examined the present paper and analyzed the scientometric study of COVID-19 research publications from the Scopus database between 2019 and 2021 with 248966 research publications and 2428009 citations. A maximum of 163085(65.50%) research publications are contributed in the year 2021. The average research publication per year is 82989. The maximum of 60964(27.26%) contributions are from the United States, the citations are 84795(3.73), CPP is 1.39, H- index is 87 and RCI is 0.14. The maximum of 22753(18.69%) contributions are Biochemistry, Genetics, and Molecular Biology. The maximum of 266(13.23%) contributions are Mahase, E, from the United States. A maximum of 157579(63.29%) research publications are contributed by articles. The maximum of 3405(11.48%) contributions are the Harvard Medical School, the maximum of 3178(15.74%) contributions from are International Journal of Environmental Research and Public

Health, the highest citations were 36889(10.98%) in the Journal of Medical Virology, with the CPP being 30.51, h-index is 82 and RCI is 1.83.

Devi Dayal et al. (2021)[22] Covid-19 and Type 1 Diabetes: A Scientometric Assessment of Global Publications based on the Scopus Database. The publications numbered 255 until August 4, 2021. Seventy-three (28.6%) were funded; these received higher average citations than non-funded (19.0 versus 9.8). Sixty-nine countries participated; the USA, Italy, and UK led in productivity, whereas Canada, the UK, and Italy were the most impactful. Barbara Davis Center, USA, University of Colorado, USA, and King's College London, UK were the most productive, whereas the University of Glasgow, UK, PGIMER-Chandigarh, India, and Barbara Davis Center, USA were the most impactful organizations. USA's Q. Ebekozien and Italy's C. Maffeis and R. Schiaffini led in productivity, whereas Italy's A. Avogaro and India's S. Bhadada and R. Pal led in impact. Diabetes Research and Clinical Practice and Diabetes Care were the leading journals. Only 12 (4.7%) publications were highly-cited.

OBJECTIVES

- ➢ To examine the growth of COVID-19 and Infertility
- ➢ To analyze the country-wise world research on COVID-19 and Infertility
- ➢ To examine subject–wise research on COVID-19 and Infertility
- ➢ To analyze the author's world research on COVID-19 and Infertility
- ➢ To analyze the document type of research on COVID-19 and Infertility
- ➢ To the analysis of keyword research on COVID-19 and Infertility
- ➢ To identify the institution's collaboration in COVID-19 and Infertility
- ➢ To study the most preferred journals COVID-19 and Infertility
- ➢ To the analysis of funding agencies in the field of COVID-19 and Infertility
- ➢ To identify the language -wise research on COVID-19 and Infertility
- ➢ To examine the highly cited papers on research on COVID-19 and Infertility

METHODOLOGY

The study is based on publication and citation data downloaded from the SCOPUS database. A Sum of 248966 records in COVID-19 from a Covered period between 2019 and 2021. Your query : ((TITLE-ABS-KEY("COVID-19") AND TITLE-ABS-KEY("Infertility") OR TITLE-ABS-KEY("Coronavirus-19") OR TITLE-ABS-KEY("COVID-19 Vaccine")) AND PUBYEAR > 2018 AND PUBYEAR < 2022 AND PUBYEAR > 2018 AND PUBYEAR < 2022) were obtained from the Scopus database were analyzed. The data was collected on 25.05.2022 and the data downloading from a Microsoft Excel sheet.

DATA ANALYSIS AND DISCUSSION

Citations per Publication (CPP)

CPP has been broadly used in the scientometric assessment to stabilize the variation in volumes of literature published by different institutions/countries and etc., Bharvi and Khaiser (2016)[23] and Sandhya (2016)[24]. From this study, CPP has been used to assess the impact of Parkinson's research publications for the years, countries, institutes, and authors for the below-mentioned formula,

$$CPP = \frac{\text{Total Citations of a Country or Institution}}{\text{Total of Publications}}$$

H-Index

Hirsch (2005)[25] proposed the h-index is one of the alternatives to the standard bibliometric indicators for single scientists, it is defined below the table,

A scientist has index h if h of his or her Np papers have at least h citations each and other papers (Np – h) have ≤ citations each.

Ye (2009)[26] found that the Glanzel-Schubert (2007)[27] model was better than the Hirsch and Egghe-Rousseau (2006)[28] model to estimate the *h*-index of countries and other units. Gupta and Bala (2013)[29] discussed the *h*-index in the various acts of Epilepsy research in India. Differences among the various models of the *h*-index are

Various methods of *h*-index

Model	Equation	Description
Hirsch	$h = \sqrt{(C / a)}$	C = Total Citations; a = Constant
Egghe-Rousseau	$h = P^{1/\infty}$	P = Total Publications; a > 1 is Lotka's Exponential
Glanzel-Schubert	$h = c\, P^{1/3}\, (CPP)^{2/3}$	c is a Constant; P = Total Publications CPP = Citations Per Publications

Relative Citation Index (RCI)

The relative citation index (RCI) was developed by the Institute of Scientific Information (now Thomson Reuters, USA) and examined the impact of different countries and institutions in the field of COVID-19 research publications. The scientific impact of leading countries was examined by using two relative indicators, namely citations per paper (CPP) and relative citations index (RCI). Citations per paper (CPP) is a relative indicator computed as the average number of citations per paper. It has been broadly used in biometric studies as it normalizes a large difference in the volumes of publications among most productive countries, institutions, and authors.

To measure both influence and visibility of a country's research global wise, the following formula has been used by Bharvi Dutt and Khaiser Nikam (2016)[23]

$$RCI = \frac{\text{A Country share of the World Citations}}{\text{A Country share of the World Publications}}$$

RCI = 1 indicates that a country's citation rate is equal to the world citation rate

RCI > 1 indicates that a country's citation rate is greater than the world citation rate

RCI < 1 indicates that a country's citation rate is lower than the world citation rate

Growth in COVID-19 and Infertility Research Publications

Table 1: Growth in COVID-19 and Infertility Research Publications

	year	Publication	%	Citations	%	h-index	CPP	RCI
1	2019	2	0.02	78	0.04	2	39.00	1.98
2	2020	1530	14.30	76902	36.49	124	50.26	2.55
3	2021	9168	85.68	133764	63.47	141	14.59	0.74
	Total	10700	100.00	210744	100.00			

Note; CPP-Citations per paper, RCI- Relative Citation Index

Table 1 shows the Publication Output and Citations Count in COVID-19 and infertility research publications during the 03-year study period between 2019 and 2021 with 10700 research publications and 210744 citations. From the study, it is identified a maximum of 9168(85.68%) research publications are contributed in the year 2021, followed by 1530(14.30%) publications in the year 2020, and 2(0.02) publications in the year 2019. The average research publication per year is 35566.7.

During the 03-year study, it is identified that a total number of 10700 research publications received 210744 citations. Out of that maximum of 133764(63.47%), citations were received in 9168 publications in the year 2021. Followed by 76902(36.49%) citations received in 1530 publications in the year 2020, and 78(0.04%) citations received in 2 publications in the year 2019. The maximum citation per paper is 50.26 in the year 2020, followed by CPP is 39.00 in the year 2019, and CPP is 14.59 in the year 2021. The maximum RCI is 2.55 in the year 2020, followed by 1.98 in the year 2019, 0.74 in the year 2020, and the average RCI is 1.76.

Top 10 countries in COVID-19 and Infertility Research Publications

Table 2 Top 10 Countries on COVID-19 and Infertility Research Publications

S.No	Country	Publications	%	Citations	%	CPP	H-Index	RCI
1	United States	3367	38.45	106966	43.73	31.77	145	1.14
2	United Kingdom	1179	13.47	44550	18.21	37.79	91	1.35
3	Italy	806	9.21	12617	5.16	15.65	48	0.56
4	India	693	7.91	8623	3.53	12.44	41	0.45
5	China	671	7.66	18263	7.47	27.22	58	0.97
6	Germany	513	5.86	21286	8.70	41.49	57	1.49
7	Canada	453	5.17	9571	3.91	21.13	48	0.76
8	Australia	374	4.27	10182	4.16	27.22	43	0.97
9	France	374	4.27	7885	3.22	21.08	38	0.75
10	Spain	326	3.72	4662	1.91	14.30	29	0.51
	Total	8756	100.00	244605	100.00			
	Others Country - 150	7000						
	Total	15756						

During the 03- year study period, the top 10 Countries' contributions are identified in Table 2, from the study the maximum of 3367(38.45%) contributions are the United States, the citations are 106966(43.73%), CPP is 31.77, H-index is 145 and RCI is 1.14. Followed by the United Kingdom, which contributed 1179(13.47%) research publications, the citations are 44550(18.21%), CPP is 37.79, H-index is 91 and RCI is 1.35. Italy with 8069.21%) research publications. The citations are 12617(5.16%), CPP is 15.65, H-index is 48 and RCI is 0.56. the lowest citations of 462(119%) Spain the CPP is 14.30, h-index 29, RCI is 0.51. Of the top ten country's total publications 8756 and citations 244605. Others the country 150 are 7000 publications, in overall publications is 15756.

Subject-wise research output COVID-19 and Infertility Research Publications

Table-3 Subject-wise research output COVID-19 and Infertility Research Publications

S.No	Subject	Publications	%
1	Agricultural and Biological Sciences	139	5.46
2	Arts and Humanities	104	4.09
3	Biochemistry, Genetics, and Molecular Biology	1605	63.06
4	Business, Management, and Accounting	61	2.40
5	Chemical Engineering	139	5.46
6	Chemistry	170	6.68
7	Computer Science	225	8.84
8	Decision Sciences	60	2.36
9	Dentistry	35	1.38
10	Earth and Planetary Sciences	7	0.28
	Total	2545	100.00

During the 03- year study period, the top 10 Subjects' contributions are identified in table 3, from the study the maximum of 1605(63.06%) contributions are Biochemistry, Genetics, and Molecular Biology, followed by Computer Science with 225(8.84%) research publications, the chemistry with 170(6.68%) research publications. During the study period the lowest subjects in Earth and Planetary Sciences 7(0.28%) research publications.

Top 10 most authors in COVID-19 and Infertility Research Publications

Table- 4 Top 10 authors in COVID-19 and Infertility Research Publications

S.No	Author	Country	Publications	%	Citations	%	CPP	H-Index	RCI
1	Baden, L.R.	United States	70	17.41	3230	13.53	46.14	6	0.78
2	Rubin, E.J.	United Kingdom	64	15.92	61	0.26	0.95	3	0.02
3	Morrissey, S.	Italy	63	15.67	29	0.12	0.46	2	0.01
4	Pollard, A.J.	India	36	8.96	6866	28.76	190.72	21	3.21
5	Hotez, P.J.	China	29	7.21	1143	4.79	39.41	13	0.66
6	Krammer, F.	Germany	29	7.21	4333	18.15	149.41	18	2.52
7	Wiwanitkit, V.	Canada	29	7.21	69	0.29	2.38	3	0.04

8	Lambe, T.	Australia	28	6.97	6812	28.53	243.29	22	4.10
9	Callaway, E.	France	27	6.72	723	3.03	26.78	17	0.45
10	Dharm, K.	Spain	27	6.72	608	2.55	22.52	13	0.38
	Total		402	100.00	23874	100.00			

Note: CPP-Citations per paper; RCI-Relative citation index

During the 03- year study period, the top 10 authors' contributions are identified in Table 4, from the study the maximum of 70(17.41%) contributions are Baden, L.R., the United States, followed by Rubin, E.J. the United Kingdom contributed with 64 (15.92%) research publications, the Morrissey, S. the Italy with 63(15.67%) research publications. During 03- the year study period the highest citations were 6866(28.76%) with Pollard, A.J. India, the CPP being 190.72, h-index is 21, RCI is 3.21, and the lowest citations of 29(0.12%) the Morrissey, S. Italy with the CPP is 0.46, h-index 2, RCI is 0.0.01.

Document Type of COVID-19 and Infertility Research Publications

Table- 5 Document Type of COVID-19 and Infertility Research Publications

S.No	Document Type	Publications	%	Cumulative	%
1	Article	5971	55.80	5971	4.69
2	Review	1544	14.43	7515	5.90
3	Letter	1216	11.36	8731	6.85
4	Note	961	8.98	9692	7.61
5	Editorial	644	6.02	10336	8.11
6	Short Survey	139	1.30	10475	8.22
7	Conference Paper	128	1.20	10603	8.32
8	Erratum	42	0.39	10645	8.35
9	Book Chapter	35	0.33	10680	8.38
10	Conference Review	10	0.09	10690	8.39
11	Book	5	0.05	10695	8.39
12	Data Paper	3	0.03	10698	8.40
13	Retracted	2	0.02	10700	8.40
		10700	100.00	127431	100.00

Document types identified during the 03-year study period on COVID-19 and Infertility research publications are shown in table 05. From the study, it is identified that a maximum of 5971(55.80%) research publications are contributed by articles, followed by 1544(14.43%) research publications are review and third-placed in Letter with 1216(11.36%) research publications. Note with 961(8.98%), Editorial with 644(6.02%), Short Survey 139(1.30%), Conference Paper with 128(1.20%), Erratum with 42(0.39%), Book Chapter with 35(0.33%), Conference Review with 10(0.09%), Book with 5(0.05%), Data Paper with 3(0.03%), Retracted with 2(0.02%). This study confirmed that more than 81.60% of research publications are contributed by Articles, reviews, and letters the remaining nearby 18.40% of research publications are identified in other form documents.

Top 10 Significant keywords in COVID-19 and Infertility Research Publications

Table- 6 top 10 significant keywords COVID-19 and Infertility Research Publications

S.No	Keyword	Publications	%
1	Human	9230	14.91
2	COVID-19	8291	13.39
3	Humans	7969	12.87
4	COVID-19 Vaccines	6898	11.14
5	Coronavirus Disease 2019	6531	10.55
6	SARS-CoV-2	6292	10.16
7	Vaccination	5450	8.80
8	SARS-CoV-2 Vaccine	4065	6.57
9	Article	3798	6.14
10	Prevention And Control	3381	5.46
	Total	61905	100.00

As seen from the Scopus database, the top 10 significant keywords seem to define and identify India's literature on COVID-19 and Infertility as well as give some idea about the broad research trends in the treatment and investigation of the disease (Table- 6). These keywords have been classified under broad subject headings along with the frequency of keyword occurrence. The maximum keyword Human is with 9230(14.91%) research publications, followed by the COVID-19 keyword with 8291(13.39%) research publications, and humans the keyword with 7969(12.87%), and the lowest keyword of Prevention And Control with 3381(5.46%).

Top 10 Organizations in COVID-19 and Infertility Research Publications

Table 7 top 10 Institutions in COVID-19 and Infertility Research Publications

S.No	Institutions	Publications	%	Citations	%	CPP	H-Index	RCI
1	Harvard Medical School	221	15.04	8161	11.23	36.93	39	0.75
2	University of Oxford	202	13.75	13818	19.02	68.41	49	1.38
3	Imperial College London	149	10.14	10293	14.17	69.08	39	1.40
4	University of Washington	142	9.67	5130	7.06	36.13	39	0.73
5	Tel Aviv University	134	9.12	5527	7.61	41.25	40	0.83
6	Inserm	131	8.92	3332	4.59	25.44	22	0.51
7	London School of Hygiene & amp; Tropical Medicine	131	8.92	9157	12.60	69.90	31	1.41
8	University of Pennsylvania	121	8.24	4159	5.72	34.37	34	0.70
9	University College London	120	8.17	8417	11.59	70.14	36	1.42
10	Centers for Disease Control and Prevention	118	8.03	4656	6.41	39.46	38	0.80
	Total	1469	100.00	72650	100.00			

Note: CPP-Citations per paper; RCI-Relative citation index

During the 03- year study period, the top 10 institutions contributions are identified in table 7, from the study, the maximum of 221(15.04%) contributions are the Harvard Medical School, followed by the University of Oxford contributed with 202(13.75%) research publications, the Imperial College London with 149(10.14%) research publications. During 03 year study period the highest citations were 13818(19.02%) with the University of Oxford with the CPP being 68.41, h-index is 140, RCI is 1.38, and the lowest citations of 3332(4.59%) the Inserm with the CPP is 25.44, h-index 22, RCI is 0.51.

Top 10 Journals in COVID-19 and Infertility Research Publications

Table 8 top 10 Journals in COVID-19 and Infertility Research Publications

S.No	Journals	Publications	%	Citations	%	CPP	H-Index	RCI
1	Vaccines	348	17.92	5449	9.34	15.66	33	0.52
2	Vaccine	238	12.26	4360	7.47	18.32	30	0.61
3	New England Journal of Medicine	232	11.95	2660	4.56	11.47	59	0.38
4	Nature	211	10.87	13506	23.15	64.01	46	2.13
5	Human Vaccines And Immunotherapeutic	207	10.66	2071	3.55	10.00	19	0.33
6	Lancet	175	9.01	13081	22.42	74.75	44	2.49
7	Frontiers In Immunology	150	7.72	1687	2.89	11.25	20	0.37
8	BMJ	134	6.90	1979	3.39	14.77	23	0.49
9	JAMA Journal of The American Medical Association	124	6.39	7344	12.59	59.23	41	1.97
10	Science	123	6.33	6212	10.65	50.50	33	1.68
	Total	1942	100.00	58349	100.00			1.00

During the 03- year study period, the top 10 Journals' contributions are identified in table 8, from the study the maximum of 348(17.92%) contributions are Vaccines, followed by Vaccine with 238(12.26%) research publications, the New England Journal of Medicine with 232(11.95%) research publications. During the ten-year study period, the highest citations were 13506(23.15%) in Nature, with the CPP being 64.01, h-index is 46, RCI is 2.13, and the lowest citations of 1687(2.89%) in the Frontiers in Immunology with the CPP is 11.25, h-index 20, RCI is 0.37.

Funding Agency of Journals in COVID-19 and Infertility Research Publications

Table 9 Funding Agency of Journals in COVID-19 and Infertility Research Publications

S.No	Funding Agency	Publications	%
1	National Institutes of Health	672	26.37
2	U.S. Department of Health and Human Services	489	19.19
3	National Institute of Allergy and Infectious Diseases	291	11.42

4	National Natural Science Foundation of China	200	7.85
5	Pfizer	177	6.95
6	National Institute for Health Research	159	6.24
7	European Commission	151	5.93
8	Bill and Melinda Gates Foundation	145	5.69
9	UK Research and Innovation	139	5.46
10	Welcome Trust	125	4.91
	Total	2548	100.00

As seen from the Scopus database, the top ten significant funding agencies seem to define and identify India's literature on COVID-19 and Infertility as well as give some idea about the broad research trends in the treatment and investigation of the disease (Table- 9). These funding agencies have been classified under broad subject headings along with the frequency of funding agencies' occurrence. The maximum funding agency is the National Institutes of Health with 672(26.37%) research publications, followed by the U.S. Department of Health and Human Services with 489(19.19%) research publications, and the National Institute of Allergy and Infectious Diseases with 291(11.420%). During the ten years study period, the lowest funding agency was Welcome Trust with 125(4.91%).

Language of COVID-19 and Infertility Research Publications

Table 10 Language of COVID-19 and Infertility Research Publications

S.No	Language	Publications	%
1	English	10306	95.75
2	Spanish	109	1.01
3	German	95	0.88
4	French	92	0.85
5	Chinese	49	0.46
6	Italian	31	0.29
7	Russian	31	0.29
8	Portuguese	21	0.20
9	Dutch	20	0.19
10	Norwegian	10	0.09
	Total	10764	100.00

As seen from the Scopus database, the top ten significant languages seem to define and identify India's literature on COVID-19 and Infertility as well as give some idea about the broad research trends in the treatment and investigation of the disease (Table- 10). These languages have been classified under broad subject headings along with the frequency of language occurrence. The maximum is the English language with 10306(95.75%) research publications, followed by the Spanish language with 109(1.01%) research publications, German language with 95(0.0.88%). During the ten years study period the lowest language is Norwegian 134(0.09%).

Top ten Highly-cited papers in Journals in COVID-19 and Infertility Research Publications

Table-11 top ten Highly-cited papers in Journals in COVID-19 and Infertility Research Publications

S.No	Titles	Citations	Document Type
1	Polack, F.P., et al (2020) Safety and efficacy of the BNT162b2 mRNA Covid-19 vaccine, New England Journal of Medicine, 383(27): 2603-2615.	4582	Article
2	Baden, L.R., et al (2021) Efficacy and safety of the mRNA-1273 SARS-CoV-2 vaccine, New England Journal of Medicine, 384(5):403-416.	2963	Article
3	Voysey, M., et al (2021) Safety and efficacy of the ChAdOx1 nCoV-19 vaccine (AZD1222) against SARS-CoV-2: an interim analysis of four randomized controlled trials in Brazil, South Africa, and the UK, The Lancet, 397(10269):99-111.	1825	Article
4	Wiersinga, W.J., et al (2020) Pathophysiology, Transmission, Diagnosis, and Treatment of Coronavirus Disease 2019 (COVID-19): A Review, JAMA - Journal of the American Medical Association, 324(8):782-793.	1766	Review
5	Grifoni, A., et al (2020) Targets of T Cell Responses to SARS-CoV-2 coronavirus in Humans with COVID-19 Disease and Unexposed Individuals, Cell,181(7):1489-1518.	1631	Article
6	Jackson, L.A., et al (2020) An mRNA vaccine against SARS-COV-2 — preliminary report, New England Journal of Medicine, 383(20): 1920-1931.	1427	Article
7	Folegatti, P.M., et al (2020) Safety and immunogenicity of the ChAdOx1 nCoV-19 vaccine against SARS-CoV-2: a preliminary report of a phase 1/2, single-blind, randomized controlled trial, The Lancet, 396(10249):467-478.	1119	Article
8	Walsh, E.E., et al. (2020) Safety and immunogenicity of two RNA-based covid-19 vaccine candidates, New England Journal of Medicine, 383(25):2439-2450.	1004	Article
9	Dagan, N., et al. (2021) BNT162B2 mRNA covid-19 vaccine in a nationwide mass vaccination setting, New England Journal of Medicine, 384(15):1412-1423.	903	Article
10	Thanh Le, T., et al. (2020) The COVID-19 vaccine development landscape, Nature reviews. Drug discovery, 19(5):305-306.	900	Note

The highly cited paper in table 11 has the highest citations 4582, and document type of articles. Polack, F.P., et al (2020) Safety and efficacy of the BNT162b2 mRNA Covid-19 vaccine, New England Journal of Medicine, 383(27): 2603-2615. The second one of the high citations of 2963 and document type of article. Baden, L.R., et al (2021) Efficacy and safety of the mRNA-1273 SARS-CoV-2 vaccine, New England Journal of Medicine, 384(5):403-416. The third one of the high citations in 1825 and document type of article. Voysey, M., et al (2021) Safety and efficacy of the ChAdOx1 nCoV-19 vaccine (AZD1222) against SARS-CoV-2: an interim analysis of four randomized controlled trials in Brazil, South Africa, and the UK, The Lancet, 397(10269):99-111. During the ten years highly citations of document type 08 article, review 01, and note 01.

MAJOR FINDING

- ❖ The paper analyzes COVID-19 research publications output in Global a scientometric analysis the publications data for the study was sourced from the Scopus database covering the COVID-19 and infertility research publications during the 03-year study period between 2019 and 2021 with 10700 research publications and 210744 citations. a maximum of 9168(85.68%) research publications are contributed in the year 2021, followed by 1530(14.30%) publications in the year 2020, and 2(0.02) publications in the year 2019.

- ❖ During the study country the maximum of 3367(38.45%) contributions are from the United States, the citations are 106966(43.73%), CPP is 31.77, H- index is 145 and RCI is 1.14.

- ❖ The study subjects a maximum of 1605(63.06%) contributions are Biochemistry, Genetics, and Molecular Biology, followed by Computer Science with 225(8.84%) research publications, the chemistry with 170(6.68%) research publications.

- ❖ During the study authors the maximum of 70(17.41%) contributions are Baden, L.R., the United States, followed by Rubin, E.J. the United Kingdom contributed with 64 (15.92%) research publications, the Morrissey, S. the Italy with 63(15.67%) research publications

- ❖ The document type of the study, it is identified that a maximum of 5971(55.80%) research publications are contributed by articles, followed by 1544(14.43%) research publications are review and third-placed in Letter with 1216(11.36%) research publications.

- ❖ During the maximum keyword Human is with 9230(14.91%) research publications, followed by the COVID-19 keyword with 8291(13.39%) research publications, and humans the keyword with 7969(12.87%).

- ❖ The study Institutions the maximum of 221(15.04%) contributions are the Harvard Medical School, followed by the University of Oxford contributed with 202(13.75%) research publications, the Imperial College London with 149(10.14%) research publications.

- ❖ During the study keyword the maximum of 348(17.92%) contributions are Vaccines, followed by Vaccine with 238(12.26%) research publications, the New England Journal of Medicine with 232(11.95%) research publications.

- ❖ The maximum funding agency is the National Institutes of Health with 672(26.37%) research publications, followed by the U.S. Department of Health and Human Services with 489(19.19%) research publications, and the National Institute of Allergy and Infectious Diseases with 291(11.420%).

- ❖ During the maximum is the English language with 10306(95.75%) research publications, followed by the Spanish language with 109(1.01%) research publications, German language with 95(0.0.88%).

- ❖ The highly cited paper has the highest citations 4582, and document type of articles. Polack, F.P., et al (2020) Safety and efficacy of the BNT162b2 mRNA Covid-19 vaccine, New England Journal of Medicine, 383(27): 2603-2615.

CONCLUSION

The outbreak of COVID-19 is quickly spreading worldwide. As of June 2020, there were over 8 million confirmed cases of COVID-19 worldwide, and the total number of deaths from this disease had exceeded 400,000. Covid-19 and Infertility, a Scientometric Assessment of Global Publications. The study Institution that has a maximum of

221(15.04%) contributions is the Harvard Medical School. During the maximum keyword, Human is with 9230(14.91%) research publications. The maximum funding agency is the National Institutes of Health with 672(26.37%) research publications. During the study country, the maximum of 3367(38.45%) contributions are from the United States, There is a rising concern by several studies on the impact of COVID-19 on male reproductive health. Based on the little evidence to date, it can be proposed that the possible pathogenicity and attack of COVID-19 on testicular tissues might affect testicular spermatozoa quality leading to poor male fertility. Special attention should be focused to evaluate an appropriate intervention in the young couples' fertility throughout and after this outbreak, specifically for those infected with the SARS-CoV-2 virus.

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