# **COVID-19 Articles: A Bibliometric Study**

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#### Abstract

**Purpose:** The study has been done to understand publications related to COVID-19. It aims to find out how many publications have been published in the subject area of the coronavirus. **Design/Methodology/approach:** The study was done on the journals on COVID-19 published from 2019 to 2021 on the PubMed database. MS Excel is used to analyse all the articles and journals.

**Findings:** A total of 1051 journal articles have been published during this period of study. The study results show that the Indian Journal of Ophthalmology, Diabetes & Metabolic Syndrome, Asian Journal of Psychiatry, Indian Journal of Medical Research, and Indian Pediatrics are the top 5 highly cited journals. Bradford's Law of Scattering finds the core journals that lead articles on COVID 19. In the year 2020, the highest number of journal articles were published on COVID-19.

**Research Limitations:** The study has been completed on journals published from 2019 to 2021 for the testing of Bradford's Law.

**Originality/value:** Before the huge spread of the COVID-19 virus, we did not know the number of publications on COVID-19. This article will help researchers in medical science as well as library and information science understand the core journals on COVID-19 as well as any related subject fields.

Keywords: Covid-19, Bradford's Law, Leimkuhler Model, Bibliometrics, Citation Study

**1. Introduction:** COVID-19, or coronavirus, is an infectious disease caused by the SARS-CoV-2 virus. The maximum number of people who are infected by the virus experience mild or moderate symptoms and can be recovered without special treatment. The virus can be spread from the infected person's mouth or nose in small liquid particles when they cough or sneeze. Since the end of 2019, the virus has spread rapidly all over the world, and in the years 2020 and 2021, the situation became very bad because a huge number of people died from this virus. The study has been completed on journals published from 2019 to 2021 for the testing of Bradford's Law. Data has been collected from PubMed. PubMed is the free online search engine for the Medline database of biomedical and life sciences. A total of 1051 journals were collected and tried to test Bradford's Law.

**2. Literature Review:** Bradford's Law, the law of scattering, was first coined by Samuel C. Bradford in the year 1934. Bradford (1934) describes how the literature on a specific subject is distributed or scattered in the journals. The law describes that "if scientific journals are arranged in order of decreasing productivity of articles on a given subject, they may be divided into a nucleus of periodicals more particularly devoted to the subject and several groups or zones containing the same articles as the nucleus when the number of periodicals in the nucleus and succeeding zones will be as follows: 1: n: n2, where 'n' is a multiplier."

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Bradford's Law of Scattering has been tested on the Ph.D. thesis awarded by the universities of Maharastra. It shows that the law is not fit for the journals of Annals of Library and Information Studies, which is the top journal in India in library and information science.

Olatokun and Makinde (2009) stated that Bradford's Law is a weapon for the selection of the most central information sources in a field. However, Bradford Law is not applicable to practical libraries and information services.

Assefa and Rorissa (2013) suggested that web citations were zero in the dissertations. Bradford's law of scattering was applicable in the journal citations. Conference proceedings in recent years were mostly cited. The study also suggested that, based on the results of the citation analysis, an institution can adopt a policy of purchasing books and journals in science and agriculture.

#### 3. Objectives: The objectives of the study are:

a) To study the most-cited articles on COVID 19,

b) To check the applicability of Bradford's Law, and

c) To study the year-wise distribution of COVID 19 articles.

**4. Methodology:** Data has been collected from the PubMed database through an advance search by specifying the year from 2019 to 2021 and the country as India. For types of documents, only journal articles were selected. In this way, a total of 1051 journal articles were retrieved, amongs which 4483 citations were distributed. An analysis has been done by applying Bradford's Law and the Luimkuhler Model.

According to Bradford's Law of Journal Productivity, in each zone, there must be a geometric series in the form of 1: n:  $n^2$ .

After testing Bradford's Law, the Leimkuhler Model is used to rectify the error of Bradford's Law. Leimkuhler (1967), Brookes (1969), and Egghe (1990) have given mathematical expressions for Bradford's law. Egghe's method is based on the earlier formulation of Leimkuhler: R(r) = aloge(1+br)

Using the following notation:

R(r) = cumulative number of articles contributed by journals of rank 1, 2, 3, ...

 $r_0$  = number of journals in Bradford's first group,

 $y_0$  = number of articles in every Bradford group

k = Bradford's multiplier.

 $y_m$  = number of articles in the most productive journal (rank 1).

a and b = constants that appear in Leimkuhler's formula.

P = number of Bradford groups.

In explaining Leimkuhle's law,

Egghe showed that

a=y<sub>0</sub>/logk, and

 $b = k - 1/r_0$ 

Egghe has introduced the mathematical formula for calculating the Bradford multiplier k as  $K = (e^{g}.ym)^{1/p}$ , where g is the Euler's number ( $e^{g} = 1.781$ );

 $Y_0 = y^2 m \log k$  and  $r_0 = (k-1)ym$ 

The number of groups is a parameter that can be freely chosen, the value of k can be calculated by using  $K = (1.781*y_m)^{1/p}$ , and  $y_0 = A/p$ , where a denotes the total number of articles.  $r_0 = T(k-1)/(k^p - 1)$ , where T is the total number of journals.

**5. Data Analysis and Interpretation:** Data analysis has been done after collecting data from the PubMed database. From Table 1, it is clear that the Indian Journal of Ophthalmology is the most cited journal in India on COVID 19. It gets 5.6% of the total citations. It is followed

Page: 19

by Diabetes & Metabolic Syndrome, which occupies 3.57% of total citations; Indian Journal of Medical Research (2.63%); Indian Pediatrics (1.81%); Dermatologic Therapy (1.76%); Journal of Association of Physicians India (1.54%); Indian Journal of Pediatric (1.41%); Medical Hypotheses (1.41%); and Journal of Medical Virology (1.36%).

		No. of	
Sl. No.	Name of the Journal	Citation	% of Citation
1	Indian Journal of Ophthalmology	251	5.60
2	Diabetes & Metabolic Syndrome	160	3.57
3	Asian Journal of Psychiatry	120	2.68
4	Indian Journal of Medical Research	118	2.63
5	Indian Podiatrics1102.02Indian Pediatrics811.81		
6	Dermatologic Therapy	79	1.76
7	Journal of Association of Physicians India	69	1.54
8	Indian Journal of Pediatric	63	1.41
9	Medical Hypotheses	63	1.41
10	Journal of Medical Virology	61	1.36
11	Science of the Total Environment	55	1.23
12	PLOS One	52	1.16
13	Indian Journal of Public Health	49	1.09
14	Scientific Reports	42	0.94
15	Front Public Health	41	0.91
16	World Neurosurgery	40	0.89
17	International Journal of Environmental Research and Public Health	33	0.74
18	Indian Journal of Medical Microbiology	30	0.67
19	International Journal of Infectious Diseases	29	0.65
20	Neurology India	29	0.65
21	Lancet	28	0.62
22	Environmental Research	27	0.60
23	BMJ Glob Health	26	0.58
24	Indian Journal of Tuberculosis	26	0.58
26	Other journals with 25 or fewer citations	2887	64.4
Total n	umber of citations distributed among the		
	journals	4483	100.00

 Table 1: Highly Cited Journals on COVID 19

Bradford's Law of Scattering describes a quantitative relationship between the number of articles published in a particular journal on a particular subject. From this law, we can understand the core journal of a particular subject.

	Cumulative No.	No. of	Total No. of	Log of Cum No. of	
No. of Journal	of Journals	Citation	Citation	Journal	% of Citation
1	1	251	251	0.00	5.60
1	2	160	160	0.30	3.57
1	3	120	120	0.48	2.68
1	4	118	118	0.60	2.63
1	5	81	81	0.70	1.81

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	Cumulative No.	No. of	Total No. of	Log of Cum No. of	
No. of Journal	of Journals	Citation	Citation	Journal	% of Citation
1	6	79	79	0.78	1.76
1	7	69	69	0.85	1.54
1	8	61	61	0.90	1.36
1	9	55	55	0.95	1.23
1	10	52	52	1.00	1.16
1	11	49	49	1.04	1.09
1	12	42	42	1.08	0.94
1	13	41	41	1.11	0.91
1	14	40	40	1.15	0.89
1	15	33	33	1.18	0.74
1	16	30	30	1.20	0.67
1	17	28	28	1.23	0.62
1	18	27	27	1.26	0.60
1	19	25	25	1.28	0.56
1	20	17	17	1.30	0.38
2	22	63	126	1.34	2.81
2	24	29	58	1.38	1.29
2	26	26	52	1.41	1.16
2	28	24	48	1.45	1.07
2	30	22	44	1.48	0.98
2	32	21	42	1.51	0.94
2	34	18	36	1.53	0.80
3	37	23	69	1.57	1.54
3	40	19	57	1.60	1.27
3	43	16	48	1.63	1.07
3	46	14	42	1.66	0.94
3	49	20	60	1.69	1.34
5	54	13	65	1.73	1.45
5	59	10	50	1.77	1.12
6	65	15	90	1.81	2.01
6	71	9	54	1.85	1.20
7	78	15	105	1.89	2.34
10	88	11	110	1.94	2.45
15	103	7	105	2.01	2.34
16	119	8	128	2.08	2.86
25	144	6	150	2.16	3.35
42	186	5	210	2.27	4.68
53	239	4	212	2.38	4,73
85	324	3	255	2.51	5,69
162	486	2	324	2 69	7 23
565	1051	1	565	3.02	12 60
Total	1051		4483	0.02	100.00

 Table 2: Citation Distribution among the Journals



#### Fig. 1: Graph of Bradford

Zone	No. of Journal	No. of Citation	% of Citation	Bradford's Multiplayer
Zonel	21	1493	33.30	
Zone2	137	1491	33.26	6.52
Zone3	892	1499	33.44	6.51
Total	1052	4483	100	

Table 3: Distribution of Journals and Their Citations in Bradford's Zone

In each zone approximately there will be one-third of the total number of the journal. According to Bradford's Law of Journal Productivity in each zone, there must be an ageometric series in the form of  $1:n:n^2$ .

From the present study Zone 1 : Zone 2: Zone 3 = 21 : 137 : 892 = 1 : 6.52 : 42.47 (deviding each by 21)  $\approx 1 : 6.52 : (6.52)^2$   $= 1 : n : n^2$ Percentage error for the  $n^2$  value = (42.51-42.47)/100 = 4%

The percentage error of the Bradford's distribution is within the permissible limit, therefore, the study finds that the COVID 19 articles citation distribution fits the Bradford's distribution, and there are 21 journals from India whose core publication domain is COVID 19.

**b)** Year-wise Distribution of COVID 19 Journal: Fig. 2 indicates that in the year 2020, the highest number of journal articles were published on COVID 19. The percentage of journal articles is 59.22% of the total citations. On the other hand, in the year 2021, the percentage of journal citations was 40.71% of total citations, and in the year 2019, the percentage of article citations was 0.07%.



Fig 2: Year-wise Distribution of Journals

**6.** Conclusion: In the year 2019, the publication on COVID-19 was started, and in the year 2020, it reached its highest peak as the virus had spread massively all over the world. In India, it has also spread widely. So very naturally, research on COVID-19 has also increased from 2019 to 2021. As a result of research, more articles on COVID-19 were published from 2019 to 2021. The study shows that the Indian Journal of Ophthalmology is the highest-cited journal on COVID-19. The Bradford's Law of Scattering is applicable in COVID-19 articles with an error of 4%, and there were 21 journals in the core zone, which leads the publication in COVID 19 related topics. Again, in the year 2020, the highest number of articles were published that were related to COVID-19.

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