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## GROWTH OF OPEN ACCESS SCHOLARLY COMMUNICATION IN BRICS COUNTRIES

Amit Kumar Verma

*Babasaheb Bhimrao Ambedkar University, Lucknow, U. P. (India), amitveri@gmail.com*

Sharad Kumar Sonkar

*Babasaheb Bhimrao Ambedkar University, Lucknow, U. P. (India), sksonker@yahoo.co.in*

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# **GROWTH OF OPEN ACCESS SCHOLARLY COMMUNICATION IN BRICS COUNTRIES**

**Amit Kumar Verma**

*Research Scholar*

*Department of Library and Information Science*

*Babasaheb Bhimrao Ambedkar University Lucknow-226025*

*Email: amitveri@gmail.com*

**Sharad Kumar Sonkar**

*Associate Professor*

*Department of Library and Information Science*

*Babasaheb Bhimrao Ambedkar University Lucknow-226025*

*Email: sksonker@yahoo.co.in*

## **Abstract**

This paper aims to investigate the present status of open access (OA) scholarly communication from Brazil, Russia, India, China and South Africa (BRICS) countries from 2011 to 2020 and compare their performance in terms of scholarly communication. Articles contributed by the scholars of BRICS countries, the data collected from Scopus database. The retrieved results are limited to the “all open access, Publisher full Gold OA, Publisher Hybrid Gold OA, Publisher Free to read Bronze OA and repository Green OA”, “articles” published in the “English language” from 2011 to 2020. Total 13,943,979 papers were published from BRICS countries, out of which 1578902 articles were published in Open Access sources. Brazil has published the highest number of OA publications (21%) regarding its total Publications. China has the highest contribution (65%) in OA publications in comparison to other BRICS countries. Although, there has been a constant growth in OA publications in BRICS countries from 66,481 in 2011 to 280,150 in 2020. China has the highest publications in all open access models. Brazil, India and South Africa have contributed more OA publications in Medicine discipline than other disciplines. The PLOS One open access scientific journal is at the top with 43,532 OA publications from Brazil, China and South Africa. This paper also includes the ranking of institutions of BRICS countries based on their OA publications from 2016 to 2019, i.e. CWTS Leiden Ranking 2021. The study is limited to BRICS countries and may increase the awareness of OA publications from BRICS countries.

## **Keywords**

*Open Access (OA), Scholarly Communication, Scholarly Publications, Open Access Sources, BRICS countries, CWTS Leiden Ranking.*

## **Introduction**

Open Access (OA) is a term that refers to unrestricted access to scholarly content. Its goal is to give people knowledge that is free of commercial benefit or commercial motives. The researchers' main issue is the poor access to journals and the low reflectiveness of valued scholarly publishing. Peter Suber define "Open access (OA) literature is digital, online, free of charge, and free of most copyright and licensing restrictions"(Suber, 2010). Open access also indicates that "users must be able to copy, use, distribute, transmit and display the work publicly and to make and distribute derivative works, in any digital medium for any responsible purpose, subject to proper attribution of authorship." The journey of open access to scholarly communication started from the triple BBB declaration like 'Budapest Open Access Initiative' of 2002, the 'Declarations of Bethesda' and 'Berlin Declaration' in 2003, and the establishment of 'Creative Commons' in 2001. The main goal of OA movement was to improve scientific communication by improving access to and maximising the impact of research findings. Open Access proves beneficial for all scholarly communication and is adopted by many higher institutions globally (Kanjilal & Das, 2015). There are some routes to attain open access (OA). Green route OA model is defined as shelf-archiving and provides the facility to the authors can archive their original or genuine work in their own or funders' website, subject and institutional repository from where readers can download the same without paying any charges. Green open positions like gratis for the authors. Very few publishers charge a fee for an additional service like an authored copyrightable portion of the printed version. The author submits the final article version after post peer review by the journals called 'post print'. Gold route OA model provides the concept of publishing all article and related content free immediately on the Journals website. In this case, articles are licensed via creative commons. Readers can download, share and reuse the same papers. The hybrid route OA model refers to subscription journals that publish particular articles as open access. A publishing charge or Article Processing Charge (APC) must be paid to the publisher to achieve this status. The author or his institution is responsible for paying the APC. You may also acquire the right to publish the final version of an article with APCs. The major disadvantage of this route of OA is twice payment first subscription of journal charges and second article processing charges, this phenomenon of income called "Double Dipping." Bronze route OA model refers to articles only available to read on the publishers' website, do not have an explicit licence, and are not available for reuse. (Björk et al., 2014; Dorta-González et al., 2017; Laakso, n.d.; Nazim, 2018; van Leeuwen et al., 2015)

Scholarly communication is the process of creating, transforming, evaluating (peer review), disseminating, and preserving information in the context of research and other scholarly endeavours. It is the most crucial aspect of the research process. Scholars' most popular way for publishing their discoveries and intellectual work in academic publications is to write a book or Journals article. However, with the introduction of the internet and other ICT applications, we may witness a variation in the publication procedures, where researchers employ a range of mediums and forms to share and promote their work. The networked digital environment has provided the facilities for the authors to publish their work directly without any hindrance. Libraries are playing a pivotal role in the scholarly communication process. One essential activity where libraries may offer good change to the scholarly communication system is through innovative research, and dissemination models are outreach to the scholarly community. (Kanjilal & Das, 2015).

### **BIRCS Countries**

In 2001, Goldman Sachs invented the name BRIC to denote the growing powers that, along with the United States, would make up the world's five largest economies. BRICS is an acronym of **Brazil, Russia, India, China, and South Africa**, representing forty-two per cent of the population. Twenty-three per cent of gross domestic product (GDP) and occupied territory is thirty per cent. The world trade of these countries is eighteen per cent. With the addition of South Africa to the group in 2011, the BRICS attained its ultimate makeup, which included a nation from Africa. (*BRICS BRASIL 2019 - What Is BRICS?*, n.d.; *Goldman Sachs / Archives - Building Better Global Economic BRICs*, n.d.; Mafika, n.d.)

### **SCOPUS database**

Scopus is one of Elsevier's premier abstracting and citation databases, launched in 2004. SCOPUS has covered approx. 36,377 titles from 11678 publishers, of which 34,346 are peer-reviewed journals in top-level subjects. SCOPUS covers top subject disciplines like life sciences, social sciences, physical sciences, and health sciences and covers three sources: book series, journals, and trade journals. SCOPUS provides the facility to search open access journals and articles by conducting a document search. We may also search for open access like green, gold, hybrid and bronze open access. The Scopus source for OA documents is Unpaywall. It is a database run by a non-profit organisation of impact story, and it is harvest the open access content from 50 thousand publisher and repositories. Scopus database supports the different open access models like green, gold, hybrid, and bronze open access. Open access data update once a week in the Scopus database. Open access research is available through

Scopus API (application programming interface). Approximately 4065 open access journals are indexed out of 21000 indexed journals (“Scopus,” 2021).

### **CWTS Leiden Ranking**

The CWTS Leiden Ranking is an annual global university ranking based on bibliometric indicators. Ranking of the institution compiled by the centre of science and technology studies at Leiden University in Netherland. CWTS Leiden ranking used the publication and citation data from Clarivate Analytics bibliographic database Web of Science. The First edition of Leiden ranking was released in 2007. Total 750 universities was listed in Leiden ranking till 2014. CWTS Leiden raking 2021 used the unpaywall data (<https://unpaywall.org/>) to determine OA status and open access publication types. (“CWTS Leiden Ranking,” 2021; Nazim, 2021).

### **Objectives of the Study**

The main aim of this study is to investigate the current status of open access publications and their growth in BRICS countries, including the top-ten institutions of these countries based on their publication in open access.

1. To find the growth of open access publication Country wise.
2. Examine the annual growth of scholarly communication.
3. To measure the growth of open access publication in different open access models.
4. To find out the major discipline to the respective country.
5. Identify the top open access publication sources to the respective country.
6. Identify the most prominent institutions of the BRICS countries in terms of OA publication.

### **Review of related literature**

Zia, S., 2021 explored in the study about research output in open access journals in BRICS countries from 2010 to 2019 and compared their performance in terms of OA. As per result, 402,199 articles were published in Open Access (OA). This study was conducted by using an advanced search option in the Web of Science core collection database. South Africa has published the highest number of research output in OA approx. 31%. Engineering and Technology paper contribution was higher in OA. Researchers from BRICS countries most contributed their papers in journals of USA and UK. Chinese Institutions played a vital role in publishing in open access journals 71.25 % of total articles published in open access. This study tries to encourage the researchers to publish their research in open access journals. (Zia, 2021).

Nazim, M., 2021 investigated in the study Open Access Uptake by Academic and Research Institutions in India. For ranking the Indian higher institution, the CWTS Leiden Ranking

database was used. A total number of 36 higher institutions has been selected for this study. The study shows that 23 % of the publication of the institutions falls in open access category. There Green OA comes first with 17 % of occurrence, and Biomedical and Health Science achieved the highest median growth (Nazim, 2021).

Nazim, M., 2018 stated in his study of gold open access status in India that examined the difference between gold open access and available research output. Among the top 20 countries, India ranks tenth in general research output and eighth place in terms of gold open access. The researcher is most comfortable in publishing with gold open access rather than foreign journals. It was also found that gold open access research output in clinical, preclinical, health, life science and physical science much higher (Nazim, 2018).

Bornmann, L., Wagner, C. and Leydesdorff, L., 2015 investigated the top-cited papers from 1990 to 2010. The authors used three steps for conducting the study: first, best-performing countries worldwide in terms of citation impact, second, the best performing countries in terms of their ability to publish highly cited papers over the last 20 years (1990–2010). Third BRICS countries have become part of the co-authorship network of highly cited articles. The analytical version of the Web of Science database was used for this study. (Bornmann et al., 2015).

Mangi, L.D., 2014 find out a quantitative analysis of BRIC's research output in Library and Information Science from 1996-2012. BRIC consists of the nations, namely Britain, Russia, India, China. For conducting the study, the author used the SCImago Journal & Country Rank database (Mangi, 2014).

Mukherjee, B., 2014 examined the green, gold and hybrid models of the Open Access journals. For the study, 462 open access journals have been taken from DOAJ, indianjournal.com, and Open-J-Gate. The characteristic of journals like growth, subject and publishers have been identified by searching individual journals' websites. Descriptive searching was used for data collection from the Directory of Open Access Journals (DOAJ), IndianJournals.com, Open J-Gate, and the Indian Citation Index (ICI) (Mukherjee, 2014).

### **Methodology**

To examine the growth of open access scholarly communication in BRICS countries, a search was conducted in Elsevier's premier abstracting and citation database Scopus on September 2, 2021. The same query string is used for each BRICS country to collect the data (AFFILCOUNTRY(Brazil..R.I.C.S) AND ( LIMIT-TO ( OA,"all" ) OR LIMIT-TO ( OA,"publisherfullgold" ) OR LIMIT-TO ( OA,"publisherhybridgold" ) OR LIMIT-TO ( OA,"publisherfree2read" ) OR LIMIT-TO ( OA,"repository" ) ) AND ( LIMIT-TO (

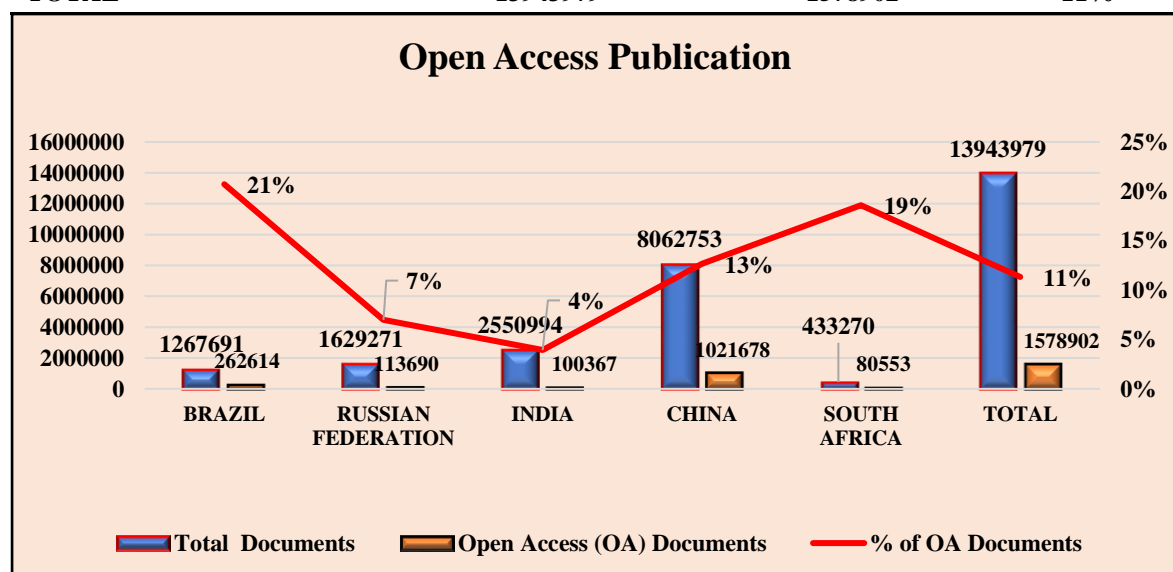
PUBYEAR,2020) OR LIMIT-TO ( PUBYEAR,2019) OR LIMIT-TO ( PUBYEAR,2018) OR LIMIT-TO ( PUBYEAR,2017) OR LIMIT-TO ( PUBYEAR,2016) OR LIMIT-TO ( PUBYEAR,2015) OR LIMIT-TO ( PUBYEAR,2014) OR LIMIT-TO ( PUBYEAR,2013) OR LIMIT-TO ( PUBYEAR,2012) OR LIMIT-TO ( PUBYEAR,2011) ) AND ( LIMIT-TO ( DOCTYPE,"ar" ) ) AND ( LIMIT-TO ( LANGUAGE,"English" ) ) ).

CWTS Leiden Ranking 2021 of Institutions is based on their number of Web of Science (WoS) indexed publications in 2016-2019. Ranking 2021 included 1225 institutions from 69 countries worldwide that have produced at least 800 WoS indexed publications in the same period. The core publication from international scientific journals are counted. For finding the rank of top ten institutions of BRICS countries, the field used all sciences; Region/Country BRICS; Type of Indicators used Open Access and ordered by P (Publications).

### Findings of the study

**Table 1- Country Wise Open Access Publications**

COUNTRIES	Total Publications	Open Access (OA) Publications	% of OA Publications
BRAZIL	1267691	262614	21%
RUSSIAN FEDERATION	1629271	113690	7%
INDIA	2550994	100367	4%
CHINA	8062753	1021678	13%
SOUTH AFRICA	433270	80553	19%
<b>TOTAL</b>	<b>13943979</b>	<b>1578902</b>	<b>11%</b>



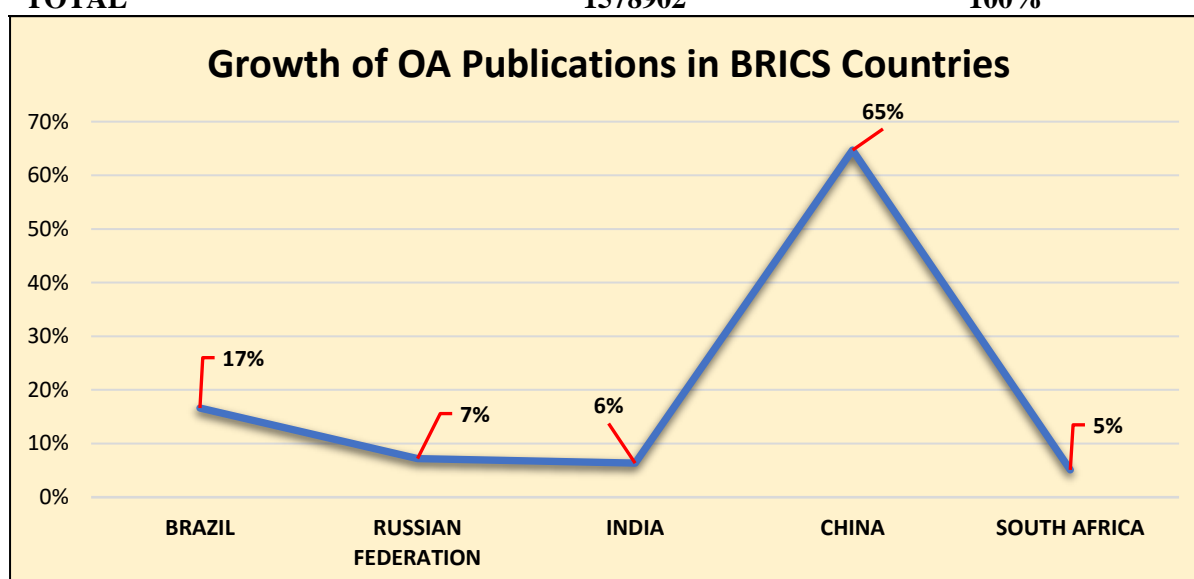
**Figure -1**

Table 1 shows the overall publications and their share published in open access from BRICS countries during the 2011 to 2020 period. 13,943,979 papers were published from BRICS countries, out of which 1,578,902 articles were published in open access mode, which is 11%

of the total. The Country-wise contribution in open access publication in respect of their total publication, Brazil is leading with 21% research output followed by South Africa (19%), China (13%), Russian Federation (7%) and India (4%).

**Table 1.1- Growth of Open Access Publications in BRICS Countries**

COUNTRIES	Open Access (OA) Publications	Open Access (OA) Publications in (%)
BRAZIL	262614	17%
RUSSIAN FEDERATION	113690	7%
INDIA	100367	6%
CHINA	1021678	65%
SOUTH AFRICA	80553	5%
<b>TOTAL</b>	<b>1578902</b>	<b>100%</b>



**Figure -1.1**

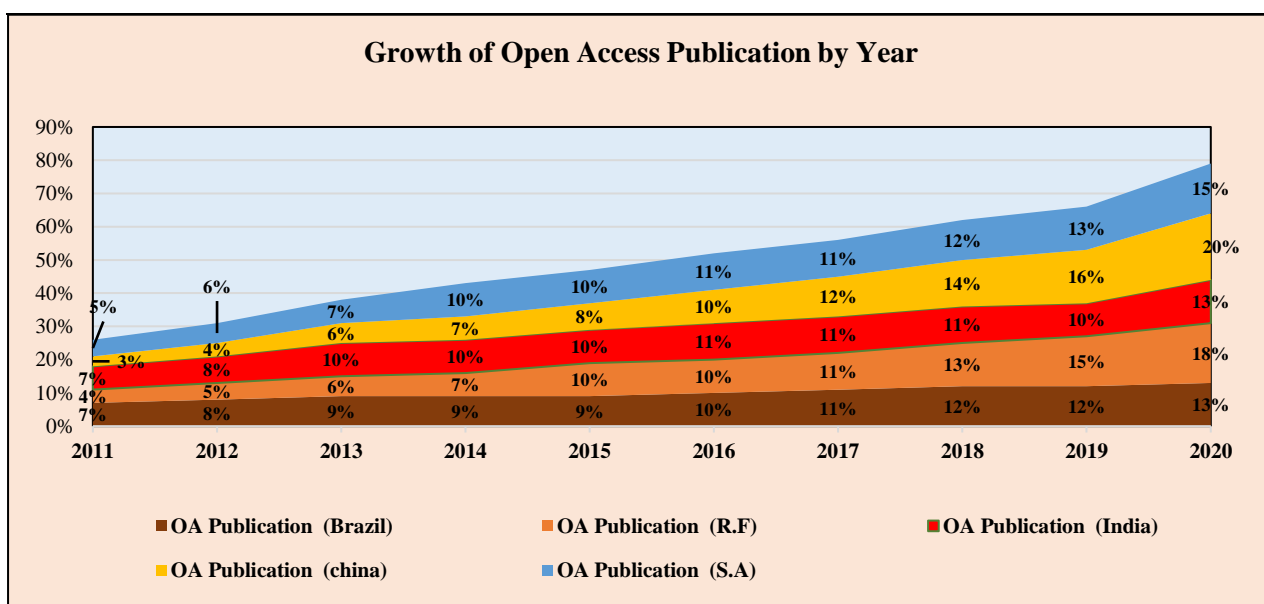
Table 1.1 shows the country-wise contribution of scholarly publications in open access sources. By analysing it is found that China is leading with 65 % OA publication followed by Brazil (17%), Russian Federation (7%), India (6%) and South Africa (5%) during the year of 2011 to 2020.

**Table 2- Year Wise Growth of Open Access Documents**

YEAR	BRAZIL	Publication Growth (%)	RUSSIAN FEDERATION	Publication Growth (%)	INDIA	Publication Growth (%)	CHINA	Publication Growth (%)	SOUTH AFRICA	Publication Growth (%)
2020	34491	13%	20863	18%	13338	13%	199256	20%	12202	15%
2019	31140	12%	17543	15%	10115	10%	168484	16%	10678	13%
2018	31188	12%	14889	13%	10556	11%	138462	14%	9783	12%
2017	29423	11%	12481	11%	10850	11%	120637	12%	9002	11%
2016	27244	10%	11382	10%	10614	11%	101438	10%	8613	11%
2015	23786	9%	11098	10%	10293	10%	85722	8%	7694	



										10%
2014	22542	9%	7649	7%	9958	10%	71533	7%	7965	10%
2013	22955	9%	7090	6%	9660	10%	60554	6%	5907	7%
2012	21630	8%	5645	5%	8272	8%	43095	4%	4701	6%
2011	18215	7%	5050	4%	6711	7%	32497	3%	4008	5%
<b>Total</b>	<b>262614</b>		<b>113690</b>		<b>100367</b>		<b>1021678</b>		<b>80553</b>	



**Figure -2**

Table 2 provides the details of the annual growth of OA publications which present the 2011 to 2020 time period total of 1,578,902 papers were published in OA from BRICS countries. It is observed that the constantly increasing growth of scholarly publications in OA journals in BRICS countries from 66,481(26%) papers in 2011 to 280,150 (79%) papers in 2020. The growth of OA publication 280,150 in 2020 is the four times of OA publication in 2011, i.e. 66,481. An impulsive growth is noted in OA publication from 2016 onwards in BRICS countries.

**Table -3 Contribution in different types of Open Access models from BRICS Countries**

COUNTRY NAME	Gold OA	Gold OA (%)	Hybrid Gold OA	Hybrid Gold OA (%)	Bronze OA	Bronze OA (%)	Green OA	Green OA (%)
BRAZIL	161973	19%	12745	12%	44199	14%	190334	17%
RUSSIAN FEDERATION	40955	5%	10148	9%	25436	8%	83975	8%
INDIA	49880	6%	8359	8%	21528	7%	73718	7%
CHINA	575696	66%	71229	64%	222224	68%	680123	62%
SOUTH AFRICA	39648	5%	8230	7%	12938	4%	62379	6%

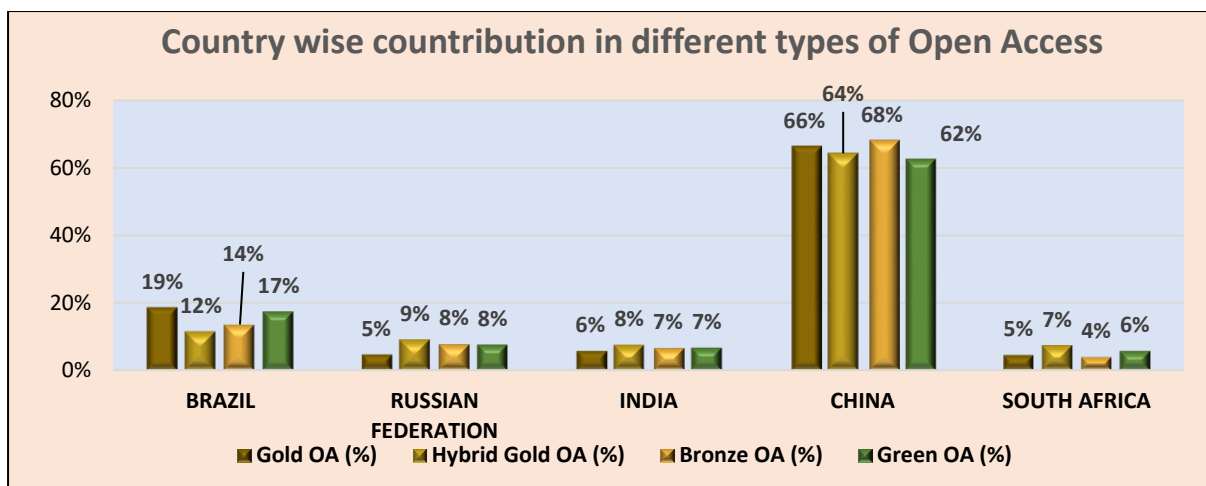


Figure-3

Table 3 shows China is leading with its contribution in all types of Open Access models. It is also observed that Green OA (self-archiving) has 1,090,529 publications from BRICS countries, which is more than other OA models. Secondary 868,152 publication in Gold Open Access. Authors are more comfortable publishing their work in a green open access model of open access.

Table -4 Country wise top Disciplines

S.No	BRAZIL	OA Pub.	RUSSIAN FEDERATION	OA Pub.	INDIA	OA Pub.	CHINA	OA Pub.	SOUTH AFRICA	OA Pub.
1	Medicine	78665	Physics and Astronomy	41310	Medicine	58520	Biochemistry, Genetics and Molecular Biology	263001	Medicine	24533
2	Agricultural and Biological Sciences	62541	Mathematics	14674	Biochemistry, Genetics and Molecular Biology	30170	Medicine	251337	Agricultural and Biological Sciences	12752
3	Biochemistry, Genetics and Molecular Biology	37841	Biochemistry, Genetics and Molecular Biology	14304	Pharmacology, Toxicology and Pharmaceutics	15235	Engineering	166450	Social Sciences	11289
4	Physics and Astronomy	27490	Materials Science	13180	Immunology and Microbiology	8290	Physics and Astronomy	145486	Physics and Astronomy	9336
5	Environmental Science	15888	Medicine	11702	Agricultural and Biological Sciences	7091	Materials Science	120018	Biochemistry, Genetics and Molecular Biology	9287

Table 4 shows the top disciplines for Open Access (OA) publications in BRICS countries. The discipline of Medicine is top in the table for three countries. Medicine has a total of 161,718 OA publications in Brazil, India and South Africa. Russia has significantly fewer OA publications of Medicine (11702) in comparison to others. The top OA publications in China are Biochemistry, Genetics and Molecular Biology, and South Africa has fewer OA publications in the same discipline. Physics and Astronomy is the top discipline in Russia, with 41310 OA publications.

**Table -5 Country wise top Sources**

S.No	BRAZIL	OA Pub.	RUSSIAN FEDERATION	OA Pub.	INDIA	OA Pub.	CHINA	OA Pub.	SOUTH AFRICA	OA Pub.
1	Plos One	7093	Scientific Reports	1900	Journal Of Clinical And Diagnostic Research	6783	Plos One	33695	Plos One	2744
2	Scientific Reports	2762	Physical Review Letters	1800	Plos One	4720	Scientific Reports	31098	Hts Teologiese Studies Theological Studies	1610
3	Ciencia Saude Coletiva	2492	Journal Of High Energy Physics	1634	BMJ Case Reports	2604	IEEE Access	26096	Mediterranean Journal Of Social Sciences	1539
4	Ciencia Rural	2377	Physical Review B	1579	International Journal Of Research In Pharmaceutical Sciences	1402	Rsc Advances	12092	South African Medical Journal	1528
5	Semina Ciencias Agrarias	1979	Physics Letters Section B Nuclear Elementary Particle And High Energy Physics	1480	Asian Journal Of Pharmaceutical And Clinical Research	1217	Optics Express	10826	Monthly Notices Of The Royal Astronomical Society	1293

Table 5 shows the top sources of OA publications in BRICS Countries. The PLOS One open access scientific journal is at the top with 43,532 OA publications from Brazil, China and South Africa. PLOS One is the reputed peer-reviewed OA journal published by the Public Library of Science. The scientific report is at the top in the source of publications in Russia with 1900 OA publications. It is an Open access mega scientific journal published by Nature Research. Journal of Clinical and Diagnostic Research (JCDR) is the top source of India with 6783 OA publications.

**Table -6 Country wise Top Institutions of BRICS Countries**

The topmost institutions' ranking of BRICS countries is based on CWTS Leiden Ranking 2021. The below tables shows the top ten Institution/Universities based on their publications and proportion of OA publications and other models of OA publications like Gold OA, Hybrid OA, Bronze OA and Green OA.

**Table-6.1 BRAZIL**

S. No.	Name of Institute	Total Pub.	OA Pub.	Gold OA Pub.	Hybrid OA Pub.	Bronze OA Pub.	Green OA Pub.
1	University of São Paulo	38628	48.6%	23.7%	5.1%	7.0%	12.9%
2	Universidade Estadual Paulista	14303	66.2%	22.9%	4.7%	5.0%	33.6%
3	University of Campinas	13544	45.4%	21.9%	6.0%	5.1%	12.5%
4	Universidade Federal do Rio de Janeiro	11686	47.4%	25.4%	6.1%	5.7%	10.2%
5	Federal University of Rio Grande do Sul	11580	41.0%	20.0%	5.4%	5.4%	10.2%
6	Universidade Federal de Minas Gerais	9497	44.5%	23.8%	4.1%	6.2%	10.3%
7	Universidade Federal de São Paulo	7343	50.4%	30.1%	4.1%	7.2%	9.0%

8	Universidade Federal de Santa Catarina	6245	33.8%	15.1%	4.3%	4.2%	10.2%
9	Universidade Federal do Paraná	5664	38.8%	19.8%	5.0%	4.8%	9.2%
10	Universidade de Brasília	4885	44.40%	23.3%	3.8%	5.60%	11.70%

Table 6.1 shows that the University of Sao Paulo is first in the ranking list with a total publication of 38,628, and the proportion of OA publications to the complete publication is 48.6%. Universidad Estadual Paulista is second in the list, whose 66.2% of OA publications and 33.6% of green OA publications are the highest compared to others. Universidad Federal de So Paulo is in seventh place, but Gold OA and Bronze Open Access is higher than others. The Universidad Federal do Rio de Janeiro ranks fourth in the rankings, but the publication's contribution to the Hybrid OA is higher than the others.

**Table-6.2 RUSSIAN FEDERATION**

S. No.	Name of Institute	Total Pub.	OA Pub.	Gold OA Pub.	Hybrid OA Pub.	Bronze OA Pub.	Green OA Pub.
1	Lomonosov Moscow State University	13465	45.80%	19.50%	8.10%	4.70%	13.60%
2	Saint Petersburg State University	6818	43.00%	14.90%	5.80%	4.30%	18.00%
3	Novosibirsk State University	6389	47.00%	22.50%	12.00%	1.80%	10.60%
4	Moscow Institute of Physics and Technology	4526	65.70%	28.10%	14.30%	3.10%	20.30%
5	National Research Nuclear University MEPhI	4115	62.50%	27.60%	17.00%	1.70%	16.20%
6	ITMO University	3104	50.20%	19.00%	5.60%	2.20%	23.40%
7	Kazan (Volga region) Federal University	3081	44.50%	18.10%	4.30%	6.80%	15.30%
8	HSE University	2986	57.30%	13.70%	6.70%	4.20%	32.70%
9	Ural Federal University	2928	30.20%	8.70%	2.50%	2.70%	16.30%
10	National Research Tomsk Polytechnic University	2685	41.30%	23.20%	7.10%	1.50%	9.60%

Table 6.2 shows that the Lomonosov Moscow State University is first in the ranking list with a total publication of 13465, and the proportion of OA publications of the complete publication is 45.8%. Moscow Institute of Physics and Technology is fourth in the list, whose 65.70% of OA publications and 28.1% of Gold OA publications are the highest compared to others. National Research Nuclear University MEPhI is fifth and has a leading publication in hybrid OA of 17%. Kazan (Volga region) Federal University is in seventh place and having a leading publication in Bronze OA. HSE University is eighth on the list and having a maximum percentage in Green OA publication.

**Table-6.3 INDIA**

S.No.	Name of Institute	Total Pub.	OA Pub.	Gold OA Pub.	Hybrid OA Pub.	Bronze OA Pub.	Green OA Pub.
1	Indian Institute of Science, Bengaluru	7629	41.20%	13.40%	4.80%	6.40%	16.60%
2	Indian Institute of Technology, Kharagpur	6887	17.40%	5.90%	1.40%	2.80%	7.20%
3	Indian Institute of Technology, Madras	6743	26.30%	10.40%	6.20%	2.60%	7.20%
4	Indian Institute of Technology, Bombay	6347	27.80%	9.10%	4.10%	3.50%	11.10%
5	Indian Institute of Technology, Delhi	5875	17.60%	7.30%	1.40%	2.30%	6.70%
6	Banaras Hindu University	5258	24.40%	11.00%	3.20%	4.20%	6.10%
7	University of Delhi	5187	36.30%	19.20%	5.50%	4.80%	6.90%
8	Indian Institute of Technology, Roorkee	4789	14.60%	6.20%	1.30%	3.00%	4.10%
9	Vellore Institute of Technology, Vellore	4544	17.80%	12.40%	0.60%	2.20%	2.60%
10	Academy of Scientific and Innovative Research (AcSIR), Ghaziabad	4436	17.90%	10.10%	0.80%	2.80%	4.10%

Table 6.3 shows the top Indian Institution ranking. In the list IISc, Bengaluru is in top position with 7629 total indexed publications in 2016-2019, including its Open Access publication of 41.20%, Bronze OA publication of 6.40% and Green OA publication 16.60%, which is maximum in comparison to others. The University of Delhi has the seventh rank in the list with leading publication in Gold OA Publication. Indian Institute of Technology, Madras is third in rank and has a leading publication in hybrid OA.

#### Table-6.4 CHINA

S.No.	Name of Institute	Total Pub.	OA Pub.	Gold OA Pub.	Hybrid OA Pub.	Bronze OA Pub.	Green OA Pub.
1	University of the Chinese Academy of Sciences	63167	36.20%	18.80%	3.70%	5.70%	8.10%
2	Shanghai Jiao Tong University	45645	43.20%	25.40%	4.40%	6.20%	7.20%
3	Zhejiang University	43033	40.20%	24.30%	3.80%	5.40%	6.70%
4	Tsinghua University	40386	35.50%	17.40%	4.90%	4.30%	8.80%
5	Peking University	37357	48.70%	24.60%	5.90%	7.30%	11.00%
6	Sun Yat-sen University	32100	48.20%	29.80%	5.10%	6.80%	6.50%
7	Fudan University	30273	49.90%	29.90%	5.00%	7.50%	7.40%
8	Huazhong University of Science and Technology	29822	38.30%	24.00%	3.00%	4.80%	6.50%
9	Sichuan University	28226	38.80%	25.30%	3.00%	5.40%	5.00%
10	Xi'an Jiaotong University	28160	31.90%	19.10%	3.00%	3.80%	6.10%

Table 6.4, as an above discussion, shows that China always tops in open access scholarly publications in BRICS nations. China has contributed 65% of total scholarly publications from BRICS countries (2011-2020). It is absolutely that its institution contribution must be high. The University of the Chinese Academy of Sciences leads with total publication from 2016 to 2019 with an OA publication of 36.20%. Fudan University is in seventh place in the list and has a maximum percentage of OA Publication 49.90%, Gold OA 29.90% and Bronze OA

7.50%. Peking University is leading in hybrid OA 5.90% and Green OA 11% and has the fifth position in the list.

**Table-6.5 SOUTH AFRICA**

S.No.	Name of Institute	Total Pub.	OA Pub.	Gold OA Pub.	Hybrid OA Pub.	Bronze OA Pub.	Green OA Pub.
1	University of Cape Town	9716	66.20%	27.50%	11.40%	9.60%	17.80%
2	University of the Witwatersrand	8251	60.10%	28.90%	10.30%	7.20%	13.70%
3	University of KwaZulu-Natal	7086	48.40%	25.00%	6.80%	5.60%	10.90%
4	Stellenbosch University	6748	53.40%	23.30%	8.30%	7.90%	14.00%
5	University of Pretoria	6705	68.50%	23.20%	5.00%	6.30%	33.90%
6	University of Johannesburg	4590	43.70%	22.20%	7.60%	3.40%	10.50%
7	North-West University	3317	48.70%	19.50%	6.10%	6.60%	16.50%
8	University of the Free State	2411	39.40%	19.00%	5.10%	5.60%	9.70%
9	Rhodes University	1875	47.90%	13.20%	6.60%	10.50%	17.70%

Table 6.5, as an above discussion, shows that South Africa has less contribution in open access scholarly publications in BRICS nations. South Africa contributed 5% only of total scholarly publications from BIRCS countries in the last decade (2011-2020). According to CWTS Leiden ranking, only nine institutes has come after applying parameter. The University of Cape Town leads with 9716 total publications, 66.20% of OA Publication, 11.40% of Hybrid OA Publications and 17.80% of Green OA Publications. The University of the Witwatersrand is in the second position in the list with the highest percentage of Gold OA, 28.90%. Rhodes University is in the ninth position in the list with 10.50% of Bronze OA Publications.

### **Conclusion**

As a result, it is possible to infer that open access scholarly communication in BRICS nations is improving. Researchers from the BRICS nations are interested in open-access journal articles. However, given the enormous potential that OA provides for BRICS nations to combine their research output for global awareness, there is still more work to be done. Mandates for OA publication should be embraced by academic institutions and government bodies and campaigns to promote awareness among the scientific community. Academic libraries may play a pivotal role to fulfil the aim of OA publications.

The study shows that 11% of Open Access Publications of entire publications is not enough to benefit the scholar community. As a result, BRICS governments, researchers, libraries, and librarians should put a long-term framework to influence the OA movement's prospects fully. Researchers from the BRICS nations should consider open access publishing as a once-in-a-lifetime chance to boost their worldwide awareness by publishing their research findings as OA publications.

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