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Unveiling the Open Access Outputs, Citation Pattern, and Altmetric Attention in the Book Citation Index by Indian Higher Education Institutions: A Data Carpentry Approach

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This paper presents the open access status of Indian Higher Education Institutions (HEIs) in the Book Citation Index (BKCI). In 2011, Thomson-Reuters introduced the BKCI as a part of the Science Citation Index for books, chapters, editorial books, etc. It examined the open access status, citations, and altmetric attention score of Indian higher education institutions. The data carpentry tool OpenRefine was employed to extract OA status, citation value and altmetric attention score with a REST API call through a data wrangling process. This study examined a total of 501 books and chapters, 2,229 authors, 8,920 citations and an altmetric attention score of 1013.66. The results showed that DOI publications accounted for only 5.56% (n=26) of the books and chapters published across four OA routes. Green OA is dominant OA (accounting for 16 books and chapters). The Indian Institute of Technology Kanpur is the highest productive institution in BKCI.

Keywords: Open Access Publication, Book Citation Index, OpenRefine, Unpaywall, Dimensions, Altmetric Attention Score, NIRF Ranking, Indian Higher Education Institutions

1. Introduction

Books are an important carrier of knowledge for social, academic and scientific communication[1,2]. In 2011, Thomson Reuters launched the Book Citation Index (BKCI). It is a new tool for bibliometric assessment. It provides a large number of bibliographic data of monographs. It covers since 2005 more than 128,000 scholarly books and more than 53.2 million cited references in all domains[3,4]. Torres-Salinas, Robinson-García, Campanario, et al. (2014) measured the coverage of BKCI, and found that 30% of books, chapters and editorial books were covered in the humanities and social sciences. However, most disciplines are covered by a few publishers, mainly from the USA and the UK. The highest number of books and chapters are present in the English language[5]. On the other hand, Chi & Glänzel (2018) explored the field-specific citation and usage patterns of book literature in the Book Citation Index[6]. For this reason, citation patterns of Books, chapters, edited books, and book series were examined by scholars[4,7]. They considered the top 5% of books and chapters in this database and found that major scientific areas differ in the edited books and publisher types. However, a large-scale study conducted by Yang et al. (2021). They analysed six disciplines, a total of 666,527 BKCI records in the year 2013-2017. It was observed that the coverage of digital object identifiers and altmetric values is relatively very low. The health science books received high altmetric value but lower citation impact. The citation frequency of the earlier publications is higher than that of the new publications[2]. Regarding the citation analysis Torres-Salinas, Robinson-García, Campanario, et al. (2014) explored that the BKCI doesn't retrieve all citations for books and chapters. Book citations do not include citations to their chapters[5]. Kousha & Thelwall (2009) have attempted to fill this gap; they examined the citation status of social science and humanities from the Thomson Reuters Institute of the scientific database with a Google book search[8].

Kousha et al. (2011) explored the citation impact of Google Books, Google Scholar books and Scopus books[9]. Following this Zhu et al. (2019) examined nine million books a total of eleven million citations. They investigated five factors: temporal change in book citations, book citation distributions, year to citation pack, citation half-life and characteristics of the most cited books[10]. In view of the above influence publications, the present study aims to identify the contributions of Indian HEIs in the BKCI; moreover,

the open access publications status, authorship patterns, gender differences, citation patterns, altmetric attention scores and reader counts in books and chapters. Specifically, the objectives of this study are:

2. Objectives

I. To examine the open access status (Green OA, Gold OA, Bronze OA and Hybrid OA) in the BKCI of the Indian HEIs in the last ten years (2012-2021).
II. To explore the authorship pattern of open access and closed access publications, prolific first authors, and gender differences of first authors in the BKCI.
III. To point out the citation pattern and top-cited books and chapters of open and closed access publications.
IV. To identify the altmetric attention and readership of open or closed access publications.

3. Methodology

The present study investigates the open access publications status and their scholarly impacts on Indian HEIs in the BKCI. This study adopted the following methodology.

3.1 Selection of institutions

This research examined the open access contributions of Indian HEIs that are ranked in the National Institutional Ranking Framework (NIRF) (2022) overall categories (https://www.nirfindia.org/2022/OverallRanking.html). The NIRF ranking is the Government of India's own ranking framework. On 29th September 2015, the Government of India launched this ranking system. On 15th July 2022, the Hon'ble Education Minister of GOI released the NIRF 2022. The NIRF 2022 ranking has examined the five main parameters (i) Teaching, Learning & Resources (TLR) ii) Research and Professional Practice (RP) iii) Graduation Outcomes (GO) iv) Outreach and Inclusivity (OI), and v) Peer Perception and sixteen sub-parameters. The NIRF 2022 overall ranking is a combined list of ten domains (universities, colleges, research institutions, engineering, management, pharmacy, medical, dental, law, and architecture) of top higher education institutions. The NIRF 2022 overall category selected a total of 200 higher educational institutions with three rank-bands (rank-band: 1-100, rank-band: 101-150 and rank-band: 151-200). The present study examined the open access status of the (rank-band:1-100) of only a hundred selected institutions.

3.2 Primary data collection

The primary publications of these selected HEIs were collected from the BKCI in December 2022. The book citation index is a part of the Web of Science core collections. It covers multidisciplinary domains, more than 128,000 editorial books and 53.2M cited references. In this study, only affiliated publications were collected. Search on the Web of Science affiliation institutions' names, then select the last (2012-2021) ten years of BKCI publications. The last ten years (2012-2021) of publications have been downloaded in CSV formats.

Among the listed top 100 institutions, 23 institutions (13 universities, 5 National Institute of Technologies, 2 Indian Institute of Technologies, one Indian Institute of Management, one AIIMS, and one college) did not index any books and chapters during the 2012–2021 period. This study examined 77 higher education institutions, a total of 501 publications. Out of which, 33 (6.59%) publications were published without a DOI. All 33 publications were excluded from this study for further processing. Table 1 presents the top 17 contributing institutions' names that have published more than 10 books and chapters in the BKCI.

3.3 Data mining

The present research collected a total of 468 with DOI publications scholarly status from different Open Data Commons Open Database License (ODbL) supported databases through REST API call with data carpentry tool OpenRefine. Table 2 highlights the overview of different REST API and responses. It identified publications' OA status, Citation metrics and Altmetric attentions.

Four types of OA are considered in this study, which are as follows:

Green OA: Self-archived versions of manuscripts. This version is not the final publisher copy [11].

Gold OA: Articles are published in an OA journal. Authors read or downloaded it directly from the journal website[12].

Hybrid OA: Articles published in a subscribed journal are immediately open for reading with a license[13].

Bronze OA: Articles are free to read on the publisher's website without attaching any legal license [11].

Four types of citations are highlighted in this research, which are as follows:

Time Citations (TC): It is indicated the total number of times publication has been cited.

Table 1 — Name of the top published institutions

SL	Institutional Name	NIRF Ranking 2022	Total publications	Publications with DOI	Publications without DOI
1	Banaras Hindu University	11	39 (7.78%)	38 (8.12%)	1 (3.03%)
2	Indian Institute of Science	02	37 (7.39%)	32 (6.84%)	5 (15.15%)
3	Vellore Institute of Technology	18	31 6.19%	31 (6.62%)	0 (0.0%)
4	Indian Institute of Technology Kanpur	05	29 (5.79%)	15 (3.21%)	14 (42.42%)
5	Thapar Institute of Engineering and Technology	57	25 (4.99%)	25 (5.34%)	0 (0.0%)
6	Indian Institute of Technology (Banaras Hindu University) Varanasi	29	23 (4.59%)	23 (4.91%)	0 (0.0%)
7	University of Delhi	23	18 (3.59%)	18 (3.85%)	0 (0.0%)
8	Amrita Vishwa Vidyapeetham	16	16 (3.19%)	14 (2.99%)	2 (6.1%)
9	Indian Institute of Technology Madras	01	15 (2.99%)	14 (2.99%)	1 (3.0%)
10	Jawaharlal Nehru University	10	13 (2.59%)	13 2.78%	0 (0.0%)
11	Indian Institute of Science Education & Research, Mohali	47	12 (2.40%)	11 (2.35%)	1 (3.0%)
12	Jadavpur University	12	11 (2.20%)	10 (2.14%)	1 (3.0%)
13	Manipal Academy of Higher Education, Manipal	17	10 (2.00%)	10 (2.14%)	0 (0.0%)
14	National Institute of Technology Rourkela	39	10 (2.00%)	10 (2.14%)	0 (0.0%)
15	Sri Ramachandra Institute of Higher Education and Research	83	10 (2.00%)	10 (2.14%)	0 (0.0%)
16	All India Institute of Medical Sciences, Delhi	09	10 (2.00%)	6 (1.28%)	4 (12.1%)
	Sub total		309 (61.68%)	280 (59.83%)	29 (87.9%)
	Other 61 institutions' publications	-	192 (38.32%)	188 (40.17%)	4 (12.1%)
	Total publications	-	501 (100%)	468 (100%)	33 (100%)

Table 2 — Use of REST API in this study

SL no	REST API	Purposes	The number of queries sent	Number of responses received (%)
1	"https://api.unpaywall.org/v2/" + DOI +"?email=Your email ID"	Open access status	468	468 (100%)
2	"https://metrics-api.dimensions.ai/doi/" + DOI	Citation status		468 (100%)
3	"https://api.altmetric.com/v1/doi/" + DOI	Altmetric status		204 (43.59%)
4	"https://api.genderize.io/?name=" + value.escape('url') + "&country_id=IN"	First Author gender		468 (100%)

Recent Citations (RC): It is the number of citations that were received in the last two years.

Field Citation Ratio (FCR): It indicates the relative citation performance of an article, when compared to similarly-aged articles in its subject area.

Relative Citation Ratio (RCR): The Relative Citation Ratio (RCR) indicates the relative citation

performance of an article, when compared to other articles in its area of research.

3.4 Data extraction with data wrangling process

In the final stage, the open source data carpentry tool OpenRefine was used to extract the scholarly status by using some light language General Refine Expression Language (GREL). This GREL is very useful for extracting JavaScript Object Notation (JSON). The data carpentry tool OpenRefine quickly extracted publication status through the data wrangling process.

4. Data analysis

4.1 Open access publications

An analysis of 468 publications shows that 94.44% (n=442) of books, and chapters were published in closed access and only 5.56% (n=26) of books and chapters were published in four open access categories. In open access routes highest number (n=16) of books and chapters (contributions 61.54% of total OA publications) have been published in Green OA, followed by four (n=4, contributions 15.38% of total OA publications) books, and chapters were published in Gold OA, fifth (n=5, contributions 19.29%) of books, and chapters in Bronze OA and only one book published in Hybrid OA. If we deeply observe Table 3, we have shown that the highest 7 (seven) numbers of OA have been published in the years 2019 and 2020. However, in the year 2019, the highest 15.91% of OA occurred during the time periods. The highest number (n=7) of OA productive institutions is the Indian Institute of Technology Kanpur. Jadavpur University secured the second position, followed by the publication of three OA books. Of the 26 open access (OA) books identified, they were distributed across 18 different sources. Among these, the highest number—four books—were published in the Annual Review of Environment and Resources, published by Annual Reviews.

4.2 Pattern of authorship

CA-Closed access, OA-Open access #CC-Collaboration coefficient

The present study examined the authorship pattern of the book citation index. In the last ten years, a total of 468 books and chapters were collaborated by a total of 2229 authors. The table 4 is shaped with the assessment to give a better understanding of authorship patterns and the collaboration coefficient of closed and OA publications during the period. In closed access groups (442), 4.07% (n=18) of books were published by single authors, 25.11% (n=111) by dual authors, and 70.81% by multiple authors. If we deeply observed open access groups, out of 26 open access books, 3.85% were published by single authors, 7.69% by dual authors and 88.46% by multiple authors. Table 4 also shows that the highest (33) number of authors' collaborations have come in closed access groups in the year 2021. The collaboration coefficient measures the mean number of authors per paper or the proportion of multiple authors[14]. The highest collaboration coefficient was observed in open access groups in the year 2015 with 0.94, followed by the year 2013 with 0.92 and the lowest number of collaboration coefficients came in closed access groups in 2016 with 0.55.

4.3 Productive Authors

Table 5 lists the 7 most prolific first authors along with the values of TNP (Total Number of Papers), TNC (Total Number of Citations), CCP (Citations Per Paper), and AAS (Altmetric Attention Score). This study listed seven first authors whose publications contributed more than 1%. Of the first seven prolific

Table 3 — Institutions' publications growth in Book citation index over the years (2012-2021)

Year	Total publications	Closed Access	Open Access	% Of OA	Open access categories			
					Green OA	Gold OA	Bronze OA	Hybrid OA
2012	24	23	1	4.17%	0	1	0	0
2013	28	25	3	10.71%	3	0	0	0
2014	25	23	2	8.00%	1	0	1	0
2015	22	21	1	4.55%	1	0	0	0
2016	28	27	1	3.57%	1	0	0	0
2017	43	43	0	0.00%	0	0	0	0
2018	51	51	0	0.00%	0	0	0	0
2019	44	37	7	15.91%	3	1	3	0
2020	65	58	7	10.77%	5	0	1	1
2021	138	134	4	2.90%	2	2	0	0
	468	442	26		16	4	5	1

Table 4 — Authorship pattern of open and closed access publications over the last ten years

Author (s)	2012		2013		2014		2015		2016		2017		2018		2019		2020		2021	
	CA	OA	CA	OA	CA	OA	CA	OA	CA	OA	CA	OA	CA	OA	CA	OA	CA	OA	CA	OA
1	1	1	3	--	3	--	--	--	3	--	2	--	--	--	2	--	2	--	2	--
2	5	--	7	--	4	--	5	--	11	--	8	--	13	--	5	1	16	1	37	--
3	4	--	6	--	4	--	8	--	7	--	14	--	6	--	9	3	7	1	26	1
4			9		4		3		5		3		14		5	1	6	2	17	1
5	8				4		2		1		2		5		5	2	4	2	14	
6	2				3		1			1	3		6		4		2		8	
7	2										3		3		3		4		4	
8						1	1				2		2		2				2	
9	1										4		1				2		3	
10							1				2		1		1		3		4	
11						1											2		1	
12				1																
13				2											1		8		2	
14					1												2	1	8	
15																			4	
17																			1	
18								1												
19																				2
33																			1	
Total	23	1	25	3	23	2	21	1	27	1	43	0	51	0	37	7	58	7	134	4
CC	0.69	0	0.57	0.92	0.62	0.89	0.68	0.94	0.55	0.83	0.68	0	0.71	0	0.70	0.69	0.71	0.74	0.70	0.83

Table 5 — Most prolific first authors and the impact of their output

Sl. No	Authors	TNP %	TNC %	CPP	AAS %
1	Aggarwal, S (Thapar Institute of Engineering and Technology)	23 (5.68%)	78 (0.93%)	3.39	3.5 (0.35%)
2	Sharma, HS (Banaras Hindu University)	13 (3.21%)	86 (1.02%)	6.62	2.5 (0.25%)
3	Sharma, A (Banaras Hindu University)	11 (2.72%)	11 (1.32%)	10.09	58.26 (5.75%)
4	Kumar, DT (Vellore Institute of Technology)	10 (2.47%)	114 (1.35%)	11.40	3.25 (0.32%)
5	Kumar, SU (Vellore Institute of Technology)	6 (1.48%)	100 (1.19%)	16.67	0 (0.00%)
6	Prasad, R (Jadavpur University)	5 (1.07%)	331 (3.71%)	66.20	17.25 (1.70%)
7	Sneha, P (Vellore Institute of Technology)	5 (1.07%)	116 (1.30%)	23.20	3 (0.30%)
	Sub total	73 (15.60%)	936 (10.49%)	12.82	87.76 (8.66%)
	Total	468 (100%)	8920 (100%)	19.06	1013.66 (100%)

authors, three are from Vellore Institute of Technology, two from BHU, and the other two are from different universities. These 7 prolific first authors contributed 15.60% (n=73) of the books and obtained 10.49% of citations, and 8.66% of altmetric attention score.

Among the seven, S. Aggarwal of TIET is the top in productivity, but the value of TNC, R. Prasad of Jadavpur University, is in the top position. The average citation per paper is 66.20. Following AAS, A. Sharma of BHU is in the top position. This study examined the first author's gender difference with the data carpentry approach. Genderize.io provides us with authors' gender information free of cost for up to 1000 queries with a REST API call. A total of 468 queries were sent with the REST API, and 100% responses were received. But when we examined JSON data, we found that 59.19% (n=277 out of 468) of authors' gender status (Male/Female) were identified by genderize.io. Figure 1 shows the first author's gender differences in the last ten years. Of the genderize.io responses to 277 queries, in the last

ten years, 51.99% (n=144 out of 277) of the first authors are female. Only 48.01% (133) are male. The highest number of 52 (contributions 57.14% out of 91 first authors) first female authors came in the year 2021. The interesting fact is that, over the last ten years average female first authors ratio is 50.57%.

4.5 Pattern of citation

Citation reflects the scholarly impact of particular publications. The present research examined the citation pattern of book citation index publications. It helps to understand the open access and closed access books and chapters' citation impacts. A total of 468 DOI books and chapters have received a total of 8,920 citations.

The average citation per book is 19.06. If we observe Table 6, we find that 7,292 citations come from 442 closed access publications (CPP 16.50). The highest 131 (contributions 29.64%) number of books belong between (1-4) citations in closed access groups. The highest 17.40% (n=1,269) percentage of citations received from 13 books between the 121 to 200 citation score range. In OA categories, 26 books have received a total of 1628 citations. Interestingly,

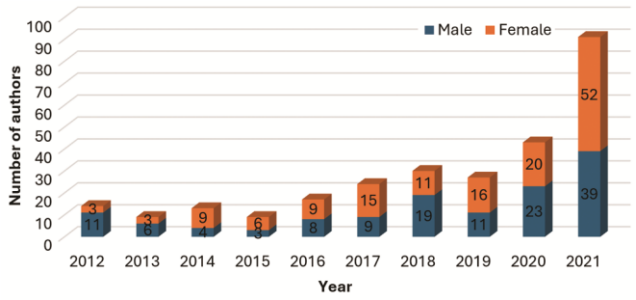

Figure 1 — Gender difference of first authors in the last ten years in the book citation index.

the average citation per book is 62.62 in OA categories. In the OA group, the highest (5) number of books belong to the citation score range of between (121-200). It received a total of 826 citations. In green OA categories, a total of 16 books and chapters received 1067 citations, followed by bronze OA categories, a total of 5 books and chapters received 522 citations; in gold OA categories, a total of 4 books and chapters received 39 citations, and in hybrid OA, one book has not received any citation.

4.6 Highly cited books and chapters

We have identified the top ten books and chapters whose time citation scores are more than 150. Table 7 lists the top ten cited books that are affiliated with Indian higher education institutions. Those top ten cited books' total citation score is 2027, which contribute 22.72%. The highest 474 number of citations comes from the Annual Review of Public Health journals in Bronze Path by Sri Ramachandra Institute of Higher Education and Research, Chennai, Tamil Nadu. Out of these top ten cited books and chapters 40% (n=4) belong to OA paths (one is bronze and three of the books and chapters are green OA). Of those top cited books and chapters 30% (n=3) have come from Babasheb Bhimrao Ambedkar University, Uttar Pradesh.

4.7 Pattern of altmetrics

Altmetric data tells the socio-academic story of scientific publications. A total of 204 books or book chapters (contributions 43.59% of a total of 468 DOI publications) have received an (1013.66) altmetric attention. The average altmetric attention score of books and chapters is 4.97. Table 8 displays closed access categories, 187 books and chapters received a

Table 6 — Citation pattern of books in the book citation index

Citation score range	Total publications	Closed access				Open access			
		Closed access papers	(%)	Number of Citations	(%)	OA papers	(%)	Number of Citations	(%)
0	47	43	9.73%	0	0.00%	4	15.38%	0	0.00%
1--4	135	131	29.64%	305	4.18%	4	15.38%	7	0.43%
5--10	99	95	21.49%	667	9.15%	4	15.38%	31	1.90%
11--20	78	74	16.74%	1092	14.98%	4	15.38%	50	3.07%
21-30	35	34	7.69%	802	11.00%	1	3.85%	29	1.78%
31--40	23	22	4.98%	787	10.79%	1	3.85%	39	2.40%
41--60	19	18	4.07%	902	12.37%	1	3.85%	56	3.44%
61--80	7	7	1.58%	477	6.54%	-	0.00%	-	0.00%
81--120	11	10	2.26%	991	13.59%	1	3.85%	116	7.13%
121-200	13	8	1.81%	1269	17.40%	5	19.23%	826	50.74%
201--474	1	0	0.00%	0	0.00%	1	3.85%	474	29.12%
Total	468	442	100%	7292	100%	26	100%	1628	100%

Table 7 — Top ten cited books and chapters, their affiliating institutions

Sl NO	Title of the book	Publication year	Time citation	Recent citation	Relative citation ratio	Publication status	Affiliations
1	Millions Dead: How Do We Know and What Does It Mean? Methods Used in the Comparative Risk Assessment of Household Air Pollution.	2014	474	124	13.94	Bronze OA	Sri Ramachandra Institute of Higher Education and Research.
2	Physics of Ultrathin Films and Heterostructures of Rare-Earth Nickelates.	2016	195	68	29.58	Green OA	Indian Institute of Science, Bengaluru
3	The Science of Geoengineering.	2013	182	36	Nil	Closed Access	Indian Institute of Science.
4	Instabilities in Viscosity-Stratified Flow.	2014	178	46	Nil	Closed Access	Indian Institute of Technology Hyderabad.
5	Energy and Human Health.	2013	173	50	3.04	Green OA	Sri Ramachandra Institute of Higher Education and Research.
6	Phytoremediation of Heavy Metal-Contaminated Sites: Eco-environmental Concerns, Field Studies, Sustainability Issues, and Future Prospects.	2020	172	99	9.06	Green OA	Babasheb Bhimrao Ambedkar University,Uttar Pradesh
7	Yeast ATP-Binding Cassette Transporters Conferring Multidrug Resistance.	2012	170	23	5.3	Closed Access	Jawaharlal Nehru University, Delhi
8	Exposure to Crystal Violet, Its Toxic, Genotoxic and Carcinogenic Effects on Environment and Its Degradation and Detoxification for Environmental Safety.	2016	164	89	4.0	Closed access	Babasheb Bhimrao Ambedkar University, Uttar Pradesh
9	Environmental Pollution, Toxicity Profile and Treatment Approaches for Tannery Wastewater and Its Chemical Pollutants.	2017	161	57	3.3	Closed access	Babasheb Bhimrao Ambedkar University, Uttar Pradesh
10	Sensitivity and Nonlinearity of Thermoacoustic Oscillations.	2018	158	75	Nil	Closed Access	Indian Institute of Technology Madras.

Table 8 — Pattern of altmetric attention score of book citation index books and chapters

Altmetric score range	Total publications	Closed access books and chapters				Open access books and chapters			
		Closed access	%	Altmetric score	%	Open access	%	Altmetric score	%
0.25--0.99	74	71	37.97%	29.75	4.08%	3	17.65%	1.50	0.53%
1.00-4.99	99	96	51.34%	191.90	26.33%	3	17.65%	8.55	3.00%
5.00--10.99	16	13	6.95%	98.48	13.51%	3	17.65%	17.00	5.97%
11.00--15.99	2	-	0.00%	-	0.00%	2	11.76%	26.35	9.25%
16.00-20.99	3	2	1.07%	35.18	4.83%	1	5.88%	19.45	6.83%
21.00--30.99	6	3	1.60%	84.49	11.59%	3	17.65%	67.73	23.78%
31.00--100.99	2	-	0.00%	-	0.00%	2	11.76%	144.27	50.65%
101.00--185.83	2	2	1.07%	289.01	39.65%	-	-	-	-
Total	204	187	100%	728.81	100%	17	100%	284.85	100%

Table 9 — Top ten AAS received books and chapters and their affiliated institutions

Sl no	Bibliography	Year of publication	AAS	Publication status	Affiliations
1	Medicinal Plants, Human Health and Biodiversity: A Broad review doi:10.1007/10_2014_273	2015	185.83	Closed Access	Jadavpur University
2	The Science of Geoengineering doi:10.1146/annurev-earth-042711-105548	2013	103.17	Closed access	Indian Institute of Science
3	Energy and Human Health doi:10.1146/annurev-publhealth-031912-114404	2013	82.24	Green OA	Sri Ramachandra Institute of Higher Education and Research
4	Millions Dead: How Do We Know and What Does It Mean? Methods Used in the Comparative Risk Assessment of Household Air Pollution doi:10.1146/annurev-publhealth-032013-182356	2014	62.03	Bronze OA	Sri Ramachandra Institute of Higher Education and Research
5	Clean Water for Developing Countries doi: 10.1146/annurev-chembioeng-061114-123432	2015	29.33	Closed Access	Institute of Chemical Technology
6	Concussive head injury exacerbates neuropathology of sleep deprivation: Superior neuroprotection by co-administration of TiO2-nanowired cerebrolysin, alpha-melanocyte-stimulating hormone, and mesenchymal stem cells doi: 10.1016/bs.pbr.2020.09.003	2020	27.58	Closed Access	Banaras Hindu University
7	Energy Efficiency: What Has Research Delivered in the Last 40 Years? doi: 10.1146/annurev-environ-012320-084937	2021	23.36	Gold OA	Jadavpur University
8	Intrinsically disordered proteins of viruses: Involvement in the mechanism of cell regulation and pathogenesis. doi: 10.1016/bs.pmbts.2020.03.001	2020	21	Bronze OA	Indian Institute of Technology, Mandi
9	Sustainable Living: Bridging the North-South Divide in Lifestyles and Consumption Debates. doi: 10.1146/annurev-environ-101718-033119	2019	19.45	Gold OA	Jadavpur University
10	The Physics of Cellular Decision Making During Epithelial–Mesenchymal Transition. doi: 10.1146/annurev-biophys-121219-081557	2020	18.88	Closed Access	Indian Institute of Science

728.81 altmetric attention score. In closed access groups, 96.26% (n= 180 out of 187) of books and chapters belong to the 0.25 to 10.99 altmetric attention score range. In the open access group, a total of 65.38% (n=17 out of 26 books) of books and chapters have received an altmetric attention score. In open access categories, 74.43% (212.00) of altmetric attention scores have come from 5 books and chapters with altmetric score ranges 21.00 to 100.99.

4.8 Highly altmetric attention book chapters

This study identified the top ten highly altmetric attention score received books and chapters. These books and chapters have received 572.88 altmetric attention scores. It constitutes more than fifty percent (56.52%) of all altmetric attention scores. Of the top ten altmetric attention score receiving books and chapters, five are present in OA routes. If we deeply observe Table 9, we found that "Medicinal Plants, Human Health and Biodiversity: A Broad Review" chapter affiliated with Jadavpur University has received the highest (185.85) altmetric attention score. Following this second highest AAS was published by 2013 published chapters "The Science of Geoengineering".

5. Discussion and Conclusion

This paper analysed the OA publications status of Indian HEIs in the BKCI and examined their scholarly impact using a data carpentry approach. Data carpentry is a skill, concept and tool that helps researchers work more effectively and smartly with data[15,16]. The data carpentry tool OpenRefine is able to extract the publication open access status, citation counts and altmetric indicators under the ODbL framework[13,17,18]. The study demonstrated that the data carpentry technique can enhance the transparency of the metric study.

This study analysed 501 books and chapters affiliated with the top Indian HEIs in BKCI during the period of 2012 to 2021. The major findings reveal that out of 100 NIRF overall top institutions, 23 institutions had no BKCI publications during this period. The number of publications in the BKCI of

Indian higher education institutions is very low. Banaras Hindu University is in the leading position. However, this analysis may be conceptualised as a filtered visibility of Indian scholarly book production rather than a comprehensive representation of all books and chapters produced by NIRF-ranked institutions. BCKI primarily indexes English language books and it's covered by few publishers mainly from the USA and the UK[5]. Consequently, the present findings reflect patterns that should not be generalised to the entire ecosystem of Indian academic publishing.

The status of OA publications is very limited, with only 5.56% (n=26) of publications available through OA routes. Based on the evidence, this research found four types of OA. Among these, Green OA is dominant. Several previous studies examined that the OA levels increased globally, nationally after 2015[11,12]. Piryani et al. (2019) and Srichandan et al. (2020) explored open access status in the Indian context across different bibliographic databases. They found OA publications proportions below thirty per cent[19,20]. So, the question is raised in this analysis: Is the BKCI index only for non-OA publication agencies?

Therefore, it appears that policymakers, funding agencies and stakeholders should support researchers in choosing OA routes and benefit from the scholarly impacts[20]. OA and Funded research outputs have received greater scholarly impacts compared with closed-access publications[11,21,22]. Similar trends were observed in this research. In closed access groups, the average citation per book and chapter is 16.50, whereas in the OA group, it increases significantly to 62.62 per book and chapter. A similar pattern is observed in altmetric attention score. For closed access book and chapter, the average altmetric attention score is 3.90, while for open access publications, it rises to 16.76 per book and chapter.

These results confirm that the OA level of Indian HEIs in BKCI remains low. However, OA publications show a clear citation advantage and receive greater altmetric attention because readers can access them easily without barriers; otherwise, such impact would not be possible. The observed difference may reflect not only an open access advantage but also potential selection effects. For instance, highly cited disciplines, internationally collaborative works, prestigious book series, or influential authors may be more likely to publish through OA routes. Therefore, the present study does not claim causal inference but reports an associative pattern between OA status and impact indicators. Future studies may apply regression-based or field-normalized models to disentangle OA effects from disciplinary and structural influences. These findings open up opportunities for Indian policy makers, funders, stakeholders and researchers to develop better strategies and models to promote sustainable OA mandates in the future. Researchers may also develop new indicators for mapping OA impact.

Use of AI text

To improve the phrasing and readability, a writing tool such as Grammarly is used.

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