

Collaborative Authorship Patterns and Applicability of Lotka's Law: An Analysis of Indian Authors' Productivity in International LIS Journals (2003–2023)

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ABSTRACT

This article reveals the collaborative authorship trend of Indian author's productivity in LIS literature published in Emerald LIS journals indexed in Web of Science database and the applicability of Lotka's law. Data retrieved from the Web of Science database for this study. 529 articles published by 1415 Indian authors in Emerald LIS Journals, study assessed the collaborative authorship trend on using different parameters like journal wise pattern, year wise collaboration, co-authorship index, ranked list of most productive authors and the level of collaboration. The Lotka's law on author productivity has also been tested to confirm the applicability of the law to the present data set. Out of 529 articles, maximum 204 articles (38.56 %) are two-authored, 130 articles (24.59%) are three-authored, followed by 77 articles (14.55 %) single-authored, 66 (12.4 %) four-authored articles and remaining 52 articles (9.8 %) by five or more author. The overall Collaborative Index (CI) and Collaborative Coefficient (CC) suggest that, on average, there is moderate collaboration in Indian contributions to Emerald Journals. The increasing trends in CI, CC, and DC over the years suggest a positive shift toward collaborative research practices. The high DC value indicates a strong culture of collaboration in recent years. The CAI values vary across years, indicating fluctuations in collaboration intensity over time. Authors such as Gupta S, Gul S, Kumar S, Kumar A, Pereira V, and Rana NP are among the most productive Indian contributors, securing 1st, 2nd, 3rd, 4th and 5th position respectively. Goodness of fit test - Kolmogorov-Smirnov (K-S) test was also used to measure the practicability of Lotka's law. This confirms that Lotka's law doesn't fit the Indian LIS literature.

KEYWORDS: Authorship pattern; Collaboration; Collaborative trend; Bibliometric Study; Lotka's Law, Kolmogorov – Smirnov (K-S) test; Indian Author's Productivity.

1. INTRODUCTION

This study carries out the perspective of an Indian author's productivity in Emerald Journals in the Field of LIS research. In this study, the investigator tried to find out the Indian Authors contribution in International leading

Journals. In earlier decades, Indian author's contributions to foreign periodicals are very less than in a few counts. But over a period of time Indian contributions have been increasing from 1990 onwards. So analyzing these contributions like features, patterns, trends and collaboration are very important and very much essential. The present study is an attempt to quantify the authorship pattern and trend in Library and Information Science (LIS) literature and test the Lotka's Law applicability by assessing the Indian author's productivity in leading Emerald journals literature.

2. OBJECTIVES

The study is imposed to evaluate the trend and impact of collaboration patterns of the Indian Author's productivity of LIS discipline published in Emerald Journals. The main objectives are

- Ascertain the year-wise collaboration trend of India's Productivity
- Emphasize the journal-wise authorship trend and collaboration pattern of India's productivity
- Illustrate the Year wise co-authorship index
- Depict the most productive authors based on their productivity
- Test the applicability of Lotka's law on author productivity distribution

3. SCOPE AND METHODOLOGY

Scope: The present bibliometric study confined to research article of 12 leading Emerald LIS journals titled , ASLIB Journal Of Information Management (ASLIB-J), ASLIB Proceedings(ASLIBP), Data Technologies And Applications(DTA), The Electronic Library(TEL), Information Technology & People(ITP), Interlending & Document Supply(IDS), Journal Of Documentation(JOD), Journal Of Enterprise Information Management(JEIM), Journal Of Knowledge Management(JKM), Library Hi Tech(LHT), Online Information Review(OTR), Program-Electronic Library And Information Systems(P-ELIS) during 2003-2023. A total of 529 Articles produced by Indian Authors are identified during the study period.

Limitations: Here, study period restricted to the publication Year from 2003 to August 2023. Only Indian Author's Contributions are considered and analysed in this study.

Methodology: Total of 529 articles produced by Indian Authors have been identified and taken into consideration for the study. The data retrieved from the Web of Science Database. The bibliographical details of 529 articles have been extracted and saved to the MS-Excel file. The data are then analysed and presented in tabular format for interpretation.

4. HYPOTHESIS: Lotka's inverse Square Law of scientific productivity fits to Indian Author's productivity dataset.

5. DATA ANALYSIS AND INTERPRETATION

On the basis of different bibliometric parameters, retrieved bibliographical data of selected articles are investigated and interpreted the under different Sections:

5.1 Journal wise Distribution of Authorship Pattern

Table 1. Journal Wise Distribution of Authorship Trend and Citation Impact

Journals Name	No. of Authors	Authorship Pattern								No. of Articles	Times Cited	Ave. Citation Per
		1	2	3	4	5	6	7	8			
ASLIB-J	57	1	6	6	4	2	0	0	0	19	121	6.37
ASLIB-P	13	0	5	1	0	0	0	0	0	6	61	10.17
DTA	116	3	22	15	2	2	1	0	0	45	134	2.98
TEL	217	29	51	17	3	2	1	1	0	104	922	8.87
ITPIDS	128	4	8	11	12	4	0	1	0	40	411	10.28
IDS	16	2	4	2	0	0	0	0	0	8	31	3.88
JOD	5	0	1	1	0	0	0	0	0	2	6	0.15
JEIM	310	2	33	25	17	15	4	0	0	96	2479	0.30
JKM	233	3	25	18	15	12	1	0	0	74	2107	28.47
LHT	109	14	12	13	4	2	1	0	0	46	334	7.26
OIR	104	6	15	11	4	1	1	0	1	39	424	10.87
P-ELIS	107	13	22	10	5	0	0	0	0	50	487	9.74
Total	1415	77	204	130	66	40	9	2	1	529	7517	14.21
%		14.56	38.56	24.57	12.48	7.56	1.70	0.38	0.19	100		
Times Cited		764	2831	2442	783	530	156	9	2	0		
Average		9.92	13.88	18.78	11.86	13.25	17.33	4.50	2.00	0		

Table 1 exhibit the journal-wise distribution of authorship trend and its citation impact of Indian author's productivity. During the study period, the 12 emerald LIS journals published 529 Indian articles written by 1415 authors and cited 7517 times at an average citation of 14.2. Among 529 articles, maximum 204 articles (38.56 %) are two-authored, 130 articles (24.59%) are three-authored, followed by 77 articles (14.55 %) single-authored, 66 (12.4 %) four-authored articles and remaining 52 articles (9.8 %) by five or more author. Highest number of 217 Indian authors contributed 104 articles received 922(8.87%) citations in the journal "The Electronic Library" , 310 Indian authors contributed 96 articles received 2479 (25.82%) in the Journal Of Enterprise Information Management followed by 233 Indian authors contributed 74 articles with 2107 (28.47%) citations in " Journal Of Knowledge Management". Further, the 50 "Program" journal articles received citation of average 9.74, "Online Information Review" journal articles received 1087 average citation and minimum average citation of 2.8 by the articles of the journal Data Technologies and Applications. Further, it also traced that the collaborated articles of two, three and four authorship attract more average citations than single authored articles.

5.2 Journal wise Distribution of Collaboration Trend

Table 2. Journal Wise Collaboration Trend

Journal Name	Authorship Pattern									CI	CC	DC
	1	2	3	4	5	6	7	8	Total			
ASLIB-J	1	6	6	4	2				19	3.00	0.61	0.95
ASLIB-P		5	1						6	2.17	0.53	1.00
DTA	3	22	15	2	2	1			45	2.58	0.55	0.93
TEL	29	51	17	3	2	1	1		104	2.09	0.41	0.72
ITPIDS	4	8	11	12	4		1		40	3.20	0.61	0.90
IDS	2	4	2						8	2.00	0.42	0.75
JOD		1	1						2	2.50	0.58	1.00
JEIM	2	33	25	17	15	4			96	3.23	0.64	0.98
JKM	3	25	18	15	12	1			74	3.15	0.62	0.96
LHT	14	12	13	4	2	1			46	2.37	0.44	0.70
OIR	6	15	11	4	1	1		1	39	2.67	0.52	0.85
P-ELIS	13	22	10	5					50	2.14	0.43	0.74
Total	77	204	130	66	40	9	2	1	529	31.09	6.36	10.47
%	14.56	38.56	24.57	12.48	7.56	1.70	0.38	0.19	100	2.59	0.53	0.87
										(Ave)	(Ave)	(Ave)

Table 2 illustrates the journal-wise distribution of collaboration trends. Authors determined the Collaborative Index (CI) by Lawani, collaborative coefficient (CC) by Ajiferuke, et al. and Degree of Collaboration (DC) by Subramanian, the average Collaborative Index (CI), Collaborative Coefficient (CC) and the Degree of Collaboration (DC) for total 529 articles is 2.59, 0.53 and 0.87 respectively. It indicates the dominance of collaborative authorship in Indian Author's publications. Out of 529 Indian Publications, maximum collaboration trend has been seen in the articles of "Journal of Enterprise Information Management", followed by Information Technology & People and Journal of Knowledge Management Journals.

5.3 Year wise Distribution of Collaboration Trend

Table 3. Year Wise Collaboration Trend of Indian Contributions in Emerald Journals

Year	Authorship Pattern								Total Authors	Total Articles	CI	CC	DC
	1	2	3	4	5	6	7	8					
2003	3	1	1	0	0	0	0	0	8	5	1.60	0.23	0.40
2004	6	2	0	0	0	0	0	0	10	8	1.25	0.13	0.25
2005	6	4	0	1	0	0	0	0	18	11	1.64	0.25	0.45
2006	7	4	0	1	0	0	0	0	19	12	1.58	0.23	0.42
2007	6	2	2	0	0	0	0	0	16	10	1.60	0.23	0.40
2008	5	8	1	0	0	0	0	0	24	14	1.71	0.33	0.64
2009	1	14	3	1	0	0	0	0	42	19	2.21	0.51	0.95
2010	6	12	1	0	0	0	0	0	33	19	1.74	0.35	0.68
2011	6	11	6	1	0	0	0	0	50	24	2.08	0.43	0.75
2012	3	6	2	0	0	0	0	0	21	11	1.91	0.39	0.73

2013	1	8	3	2	1	0	0	0	39	15	2.60	0.55	0.93
2014	3	8	5	0	1	0	0	0	39	17	2.29	0.48	0.82
2015	3	12	7	1	0	0	0	0	52	23	2.26	0.50	0.87
2016	1	16	6	0	1	1	0	0	62	25	2.48	0.55	0.96
2017	3	12	8	5	0	0	0	0	71	28	2.54	0.54	0.89
2018	2	10	7	1	2	0	1	1	72	24	3.00	0.57	0.92
2019	3	8	9	6	3	1	0	0	91	30	3.03	0.59	0.90
2020	1	17	20	5	2	0	0	0	125	45	2.78	0.60	0.98
2021	4	22	10	15	11	2	0	0	205	64	3.20	0.62	0.94
2022	6	18	33	18	11	4	1	0	299	91	3.29	0.63	0.93
2023	1	9	6	9	8	1	0	0	119	34	3.50	0.66	0.97
Total	77	204	130	66	40	9	2	1	1415	529	2.29	0.46	0.79

Table -3 Explains the Year-wise distribution of collaborative Index (CI), Collaborative co-efficient and Degree of Collaboration (DC) of the Indian productivity from 2003 to 2023. CI ranges from approximately 1.60 (2003) to 3.50 (2023). The Average CI for all years is 2.29. CC ranges from 0.23 (2003) to 0.66 (2023). The Average CC for all years is 0.46. DC ranges from approximately 0.25 (2004) to 0.97 (2020). The Average DC for all years is 0.79. In early years (2003-2009), the degree of collaboration (DC) shows an increasing trend, indicating a growing culture of collaboration in Indian contributions to Emerald Journals. In recent years (2010-2023) the Collaboration continues to increase, with 2023 showing a particularly high DC of 0.97, suggesting a high level of collaboration among researchers. The overall Collaborative Index (CI) and Collaborative Coefficient (CC) suggest that, on average, there is moderate collaboration in Indian contributions to Emerald Journals. The increasing trends in CI, CC, and DC over the years suggest a positive shift toward collaborative research practices. The high DC value indicates a strong culture of collaboration in recent years.

5.4 Co-Authorship Index

Table-4 Year Wise Collaboration Trend Of Indian Contributions in Emerald Journals

Year	1	CAI	2	CAI	3	CAI	4	CAI	5	CAI	6	CAI	7	CAI	8	CAI	Total
2003	3	412.21	1	51.86	1	81.38		0.00		0.00		0.00		0.00		0	5
2004	6	515.26	2	64.83		0.00		0.00		0.00		0.00		0.00		0	8
2005	6	374.73	4	94.30		0.00	1	72.87		0.00		0.00		0.00		0	11
2006	7	400.76	4	86.44		0.00	1	66.79		0.00		0.00		0.00		0	12
2007	6	412.21	2	51.86	2	81.38		0.00		0.00		0.00		0.00		0	10
2008	5	245.36	8	148.18	1	29.07		0.00		0.00		0.00		0.00		0	14
2009	1	36.16	14	191.07	3	64.25	1	42.19		0.00		0.00		0.00		0	19
2010	6	216.95	12	163.78	1	21.42		0.00		0.00		0.00		0.00		0	19
2011	6	171.75	11	118.85	6	101.73	1	33.40		0.00		0.00		0.00		0	24
2012	3	187.37	6	141.44	2	73.99		0.00		0.00		0.00		0.00		0	11
2013	1	45.80	8	138.30	3	81.38	2	106.87	1	88.17		0.00		0.00		0	15

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2014	3	121.24	8	122.03	5	119.68		0.00	1	77.79		0.00		0.00		0	17
2015	3	89.61	12	135.29	7	123.85	1	34.85		0.00		0.00		0.00		0	23
2016	1	27.48	16	165.96	6	97.66		0.00	1	52.90	1	235.1		0.00		0	25
2017	3	73.61	12	111.13	8	116.26	5	143.13		0.00		0.00		0.00		0	28
2018	2	57.25	10	108.05	7	118.69	1	33.40	2	110.21		0.00	1	1102.0	1	2204	24
2019	3	68.70	8	69.15	9	122.08	6	160.30	3	132.25	1	195.9		0.00		0	30
2020	1	15.27	17	97.96	2	180.85	5	89.06	2	58.78		0.00		0.00		0	45
2021	4	42.94	22	89.14	1	63.58	1	187.86	1	227.30	2	183.6		0.00		0	64
2022	6	45.30	18	51.29	3	147.57	1	158.54	1	159.86	4	258.3	1	290.66		0	91
2023	1	20.21	9	68.64	6	71.81	9	212.17	8	311.18	1	172.8		0.00		0	34
Total	7	100.00	204	100.00	1	100.00	6	100.00	4	100.00	9	100.0	2	100.00	1	100	529
	7				3		6		0			0					

Table 4 illustrates the CAI for different authorship patterns (1 through 8) for each year, with corresponding values representing the collaboration intensity for each pattern. The CAI values vary across years, indicating fluctuations in collaboration intensity over time. Early years 2003 to 2009 showed a gradual increase in collaboration, with varying degrees of collaboration intensity for different authorship patterns. From 2010-2014, the collaboration seems to be increasing patterns like 7 & 8 (seven and eight authors) showing high CAI values in some years. 2015-2023 data suggests fluctuations in collaboration intensity, with varying CAI values for different patterns in recent years. Notably, Pattern 6 consistently shows high CAI values in various years, indicating a high level of collaboration for papers with six authors.

5.5 Most Productive Authors

Table 5. Most Productive Authors

Authors	Record Count	% of 529	Rank
Gupta S	18	3.403	1
Gul S	16	3.025	2
Kumar S	15	2.836	3
Kumar A	14	2.647	4
Pereira V	10	1.89	5
Rana NP	10	1.89	5
Shah TA	9	1.701	6
Chatterjee S	7	1.323	7
Dwivedi YK	7	1.323	7
Kumar BTS	7	1.323	7
Kumar V	7	1.323	7
Luthra S	7	1.323	7
Madalli DP	7	1.323	7
Chandrakar R	6	1.134	8
Madhusudhan M	6	1.134	8
Modgil S	6	1.134	8

Table-5 briefs the most productive Indian authors based on the number of publications and the author's rank. Authors such as Gupta S, Gul S, Kumar S, Kumar A, Pereira V, and Rana NP are among the most productive Indian contributors, with varying numbers of publications. The top four authors (Gupta S, Gul S, Kumar S, and Kumar A) collectively contribute more than 11% of the total publications. Authors Pereira V and Rana NP share the 5th position, each contributing 1.89% of the total publications. Authors from positions 6 to 13 share the same rank, each contributing 1.32% of the total publications. Gupta S, with 18 publications, contributes to approximately 3.4% of the total publications, securing the First position, Gul S, Kumar S, Kumar A, Pereira V, and Rana NP secured 2nd, 3rd, 4th and 5th position respectively.

5.6 Application of Lotka's Law on Author Productivity

Table 6. Distribution of Number of Articles According to Observed Authors and Expected Authors

No of contributions(x)	Observed No. of authors(y)	% of observed authors in	Expected no of authors (n=2.590)	% of expected authors
1	747	77.41	747.00	77.36
2	124	12.85	124.07	12.85
3	53	5.49	43.41	4.50
4	16	1.66	20.61	2.13
5	9	0.93	11.56	1.20
6	3	0.31	7.21	0.75
7	6	0.62	4.84	0.50
9	1	0.10	2.52	0.26
10	2	0.21	1.92	0.20
14	1	0.10	0.80	0.08
15	1	0.10	0.67	0.07
16	1	0.10	0.57	0.06
18	1	0.10	0.42	0.04
	965		965.59	

Table 6 shows the distribution of articles according to the observed authors and the expected authors. According to Lotka's law, number of article (X) produced is inversely proportional to number of authors (Y) producing them. The authors have followed the Sen's method¹⁶ to examine the applicability of the Lotka's law to the present data set of author productivity distribution. The simplest equation of Lotka's law is: $X_n \cdot Y = C$ (1) where X stands for number of contributed articles; Y stands for the number of authors; n and C are constants.

Now, putting the value of first row (i.e. $X = 1$; $Y = 747$) in Equation 1, the following can be found. $1n \cdot 747 = C$ [$1n = 1$] $\cdot C = 747$. Now, putting the value of second row (i.e. $X = 2$; $Y = 124$; $C = 747$) in Eqn. 1, the following can be found. $2n \cdot 124 = 747$

- $2n = 747 / 124$
- $n \log 2 = \log 6.024$
- $n (0.301) = 0.7798$
- $n = 0.7798 / 0.301 \cdot n = 2.590$

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Using the value of $C=747$ and $n = 2.590$ in the Eqn. 1, the expected values are calculated and presented in the Table 7. In the present study, total 965 Indian authors contribute 529 articles in Emerald Foreign Periodicals during the period of 2003 to 2023. There are 747 authors (77.41 %) contributing one article, 124 author (12.85 %) contributing two article, 53 author (5.49 %) contributing three articles and so on. To calculate the value of n , data from observed authors is used and is found to be 2.59 i.e., $n=2.59$. It is clear from Table 6 that the observed and expected authors are nearly same. Pao recommended to use the Kolmogorov Smirnov (K-S) goodness-of-fit test for confirmation of the applicability of Lotka's law in the present data set.

5.6.1 Determining the value of 'n', 'C' and C.V

To determine the value of 'N', 'C' and C.V.:- The Lotka's law deals with the distribution frequency of authors productivity in a particular subject. In the present study, an attempt is being made to study the applicability of Lotka's law in the field of Library & Information Science.

Table 7 : Determining the value of 'n', 'C' and C.V

No. of Contributions (X)	Observed No. of Authors(Y)	xlog	Ylog	Xylog	X ²	X2	x ⁿ	1/X ⁿ
1	747	0.000	2.873	0.000	0.000	0.000	1.000	1.000
2	124	0.301	2.093	0.630	0.091	0.091	6.021	0.166
3	53	0.477	1.724	0.823	0.228	0.228	17.209	0.058
4	16	0.602	1.204	0.725	0.362	0.362	36.252	0.028
5	9	0.699	0.954	0.667	0.489	0.489	64.615	0.015
6	3	0.778	0.477	0.371	0.606	0.606	103.612	0.010
7	6	0.845	0.778	0.658	0.714	0.714	154.456	0.006
9	1	0.954	0.000	0.000	0.911	0.911	296.134	0.003
10	2	1.000	0.301	0.301	1.000	1.000	389.045	0.003
14	1	1.146	0.000	0.000	1.314	1.314	929.976	0.001
15	1	1.176	0.000	0.000	1.383	1.383	1111.927	0.001
16	1	1.204	0.000	0.000	1.450	1.450	1314.228	0.001
18	1	1.255	0.000	0.000	1.576	1.576	1783.018	0.001
	965	10.438	10.406	4.175	10.122	10.122	6207.493	1.293

$$N = N \sum XY - \sum X \sum Y / N \sum x^2 - (\sum x)^2$$

N = number of sets of data, x = logarithm of x , (i. e. number of publications) Y = logarithm of (y , i. e. number of authors)

$$= 13(4.175) - (10.438 * 10.406) / 13(10.122) - (10.438)^2 = 54.275 - 108.617 / 131.586 - 108.951$$

$$= -54.395 / 22.635 N = -2.403$$

C.V (Critical Value) = $n / \sqrt{\sum y}$

$$= -2.403 / \sqrt{965} = -2.406 / 31.064 \quad \text{C.V.} = -0.077 \quad \text{C} = 1 / \sum 1/x_n = 1 / 1.293 C = 0.7733$$

From the above mathematical calculation $n = -2.403$, $c = 0.7733$, $c.v. = -0.707$

5.6.2 The Kolmogorov-Smirnov (K-S) One Sample Test

The Kolmogorov-Smirnov (K-S) goodness-of-fit test was used to confirm the applicability of the Lotka's law to the observed values. The maximum deviation (Dmax) is calculated by using $n=2.590$ in expected number of authors and it is found that the value of D is 0.010.

Table 8. K-S Test Of Observed And Expected Distribution Of Authors
(N=2.590), C=0.7733, C.V= -0.0774

No. of Contribution s (X)	Observed No. of Authors(Y)	Cumulative of Observed Authors	Relative Frequency of Observed authors (Fo)	Expected no. of Authors(n=2.590)	Cumulative of Expected Authors	Relative Frequency of Expected Authors (fe)	Deviation = (fo-Fe)
1	747	747	0.774	747.000	747.000	0.774	0.000
2	124	871	0.903	124.066	871.066	0.902	0.000
3	53	924	0.958	43.409	914.475	0.947	0.010
4	16	940	0.974	20.606	935.080	0.968	0.006
5	9	949	0.983	11.561	946.641	0.980	0.003
6	3	952	0.987	7.210	953.851	0.988	-0.001
7	6	958	0.993	4.836	958.687	0.993	0.000
9	1	959	0.994	2.523	961.210	0.995	-0.002
10	2	961	0.996	1.920	963.130	0.997	-0.002
14	1	962	0.997	0.803	963.933	0.998	-0.001
15	1	963	0.998	0.672	964.605	0.999	-0.001
16	1	964	0.999	0.568	965.173	1.000	-0.001
18	1	965	1.000	0.419	965.592	1.000	0.000
	965		12.554	965.592			

$$D = \text{Max} | F_o(X) - S_n(X) |$$

Where $F_o(X)$ is the cumulative frequency of expected value
 $S_n(X)$ is the cumulative frequency of observed value.

The K-S goodness – of –fit test is used to test the validity of Lotka's law on the observed

Frequency of authors compared to the expected frequency of authors' productivity. Looking at the third row in Table 8, the maximum deviation between the overall distributions was found to be $D_{\text{max}} = 0.010$ which is higher than the observed significant value, i.e. C.V. = **-0.0774**.

Therefore, it can be confirmed that the K-S test reveals that the current data set does not confirm the applicability of Lotka's law in the field of LIS research produced by Indian Authors.

CONCLUSION

From the bibliometric analysis of Indian author's productivity we come to a conclusion that some of the emerald journals have a significant impact, both in terms of the number of publications and citation impact & these patterns can provide valuable insights. The analysis reveals a positive and increasing trend in collaboration among Indian contributions to Emerald Journals, as reflected in the Collaborative Index (CI), Collaborative Coefficient (CC), and Degree of Collaboration (DC). This trend suggests a growing emphasis on collaborative research practices in the field. The CAI values represent the collaboration intensity, with higher values suggesting more collaborative efforts. Fluctuations in CAI values across years and patterns may indicate changing collaboration trends or research focus. Analyzing these trends can offer insights into the evolving nature of collaboration in the represented domain. Authors such as Gupta S, Gul S, Kumar S, Kumar A, Pereira V, and Rana NP are among the most productive Indian contributors, with varying numbers of publications. The top four authors (Gupta S, Gul S, Kumar S, and Kumar A) collectively contribute more than 11% of the total publications. The maximum deviation between the overall distributions was found to be $D_{max} = 0.010$ which is higher than the observed significant value, i.e. $C.V. = 0.0774$. Therefore, it can be confirmed that the K-S test reveals that the current data set does not confirm the applicability of Lotka's law in the field of LIS research produced by Indian Authors.

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