

# Authorship and Collaboration Pattern on Jaundice Research Published by SAARC Countries During 1999-2018: A Scientometric Analysis

Saumen Das<sup>1\*</sup>, Mithu Anjali Gayan<sup>2</sup>, Manoj Kumar Verma<sup>3</sup>

<sup>1\*</sup> Department of Library and Information Science, Mizoram University

Aizawl, India

{saumendas1990@gmail.com}

<sup>2</sup> Department of Library and Information Science

Tripura University, Agartala, India

{mithuanjaligayan@tripurauniv.in}

<sup>3</sup> Department of Library and Information Science

Mizoram University, Aizawl-796004, India

{manojdlis@mzu.edu.in}



**ABSTRACT:** The present study is a scientometric study of the topic “Jaundice” literature published by SAARC countries from the year 1999 to 2003. The main aim of the study is to show the authorship and collaboration pattern by using different scientometric tools. For the purpose of the study Web of Science database was used to collect bibliographic data. A total of 1048 papers was found. Indicators such as Degree of collaboration, Collaborative Index, Modified collaborative co-efficient, Collaboration co-efficient and Activity Index are applied to the collected data. From the study, it was found that a total of 1027 (98%) publications was published in co-authorship whereas only 21(2%) in single authorship. The highest collaborative effort has been observed among the single authors (146.78). Multiple-authored papers were found to receive more citations than that of single-authored papers.

**Keywords:** Scientometric, Bibliometric, Authorship pattern, Jaundice, Activity Index, Modified Collaborative co-efficient

**Received:** 22 February 2020, Revised 10 May 2020, Accepted 28 May 2020

**DOI:** 10.6025/jstm/2020/1/3/104-112

## 1. Introduction

Scientometrics is the study of the measurement of scientific productivity by using different tools and techniques. In this study, researchers attempted to evaluate the Authorship and Collaboration pattern of the literature on the topic “Jaundice”. In today’s world, people are dependent on ICT, and they are much more interested to work collaboratively with others, which helps society to make information-rich on a particular topic. “Jaundice” is a medical term in which the color of the skin and eyes become yellowish due to the increase of bilirubin in the body. In maximum cases, it is found that newborn babies suffer from this compared to adults. Jaundice is a sign of the causation disease process, Doerr, S. (n.d.). This paper, particularly focuses on the approach of collaboration among the researchers working in the field of Jaundice especially from countries belonging to the South Asian Association for Regional Cooperation (SAARC) region. Britannica, T. (n.d.). South Asian

Association for Regional Cooperation (SAARC), organization of South Asian nations, founded in 1985 and dedicated to economic, technological, social, and cultural development emphasizing collective self-reliance. Its seven founding members are Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka. Afghanistan joined the organization in 2007. To boost up the visibility of research, it is very important to work collaboratively.

## 2. Objectives

1. To identify the authorship pattern in the field of Jaundice literature from SAARC countries
2. To determine the magnitude of collaborative measures
3. To find out the Activity Index of the SAARC countries
4. To discover the impact of the articles over the years

## 3. Review of Literature

Biradar & Tadasad (2015) tried to find out the authorship and collaboration pattern in the field of Economics. It was found that maximum papers were produced out of solo research; CI varied from 1.80 to 2.29; DC was highest (0.58) during 2000-2014.

Jhamb & Singh (2019) in their study scrutinized Geology literature published by Indian Geologists. It was found that those internationally collaborated articles received a maximum number of citations, but most articles considered for the study domestically collaborated papers. Among the internationally collaborated papers, the USA ranked at the top. "Himalayan Geology" was found to be the top-ranked journal.

Mondal & Maity (2019) conducted a study to find out foreign authorship patterns in 3 leading Library and Information Science journals, namely Annals of Library and Information Studies, DESIDOC Journal of Library & Information Technology and SRELS Journal of Information Management. The Dataset was manually collected for this study and citation data was collected from Google scholar. 186 foreign authored papers were detected having received 1267 citations with the average citations of 6.81 per article and h-index of 16. The Nigerian authors share was highest, followed by authors from USA. Chennupati K Ramaiah produced maximum internationally co-authored papers. "User study" followed by 'Scientometrics/bibliometrics' was the most preferred area of foreign authors.

Ramalingam & Elangovan (2018) examined the collaborative pattern of authors in the field of Chromosome Anomalies. 35912 records for performing the study were retrieved from PubMed. Journal articles were the most cited documents. The growing trend of solo research was found in chromosome anomalies research, unlike most other studies.

Singh & Verma (2019) evaluated the authorship pattern and collaboration pattern in the SRELS Journal of Information Management during 2008-2017. Data were manually collected from the journal's website. It was found that the average collaboration index was 1.86, the average collaboration coefficient was 0.36, and the average degree of collaboration was 0.66. The highest activity index for India is counted in the year 2009 and the lowest activity index is counted in the year 2013.

Yoda & Kuwashima (2019) studied the collaboration pattern before and after the clarification of Japanese regulation among universities, industries, and governments. 'Triple helix' method was used for the study. It was found that reforms in the regulations changed the collaboration pattern of university-industry-government relations. "Industry-government collaboration led the development of university-industry-government relations before deregulation, and university-industry collaboration did so after deregulation".

## 4. Methodology

For the study, research done in the area of Jaundice from the SAARC region is considered. The citation data was down-loaded from the Web of Science database. To retrieve the dataset for conducting the current study the following search strategy was used "TS= (Jaundice OR Icterus) **Refined by: COUNTRIES/REGIONS: (INDIA OR SRI LANKA OR BANGLADESH OR PAKISTAN OR NEPAL)** **Timespan: 1999-2018. Indexes: SCI-EXPANDED, SSCI, A & HCI**". A total of 1048 records was

retrieved on been using this search query. The records retrieved are analyzed henceforth.

#### 4.1. Formulas used

##### 4.1.1. Degree of Collaboration (DC)

(Subramanyam, 1980) propounded the DC, a measure to calculate the proportion of single and multi-author papers and to interpret it as a degree. According to Subramanyam,

$$DC = Nm/(Ns + Nm)$$

Where,

$Nm$  = The number of multi authored papers,  $Ns$  = The number of single-author papers

DC varies from 0 when all the papers have a single author to 1 when all the papers have more than one author. It can be easily calculated and can also be easily interpreted.

##### 4.1.2. Collaborative Coefficient

Ajiferuke et al. (1988) put forward the formula for collaboration coefficient (CC) as

$$CC = 1 - \frac{\sum_{j=1}^A (1/j) f_j}{N}$$

$f_j$  denotes the number of  $j$  authored research papers

$N$  denotes the total number of research papers published

$k$  is the greatest number of authors per paper

It is detected by Ajiferuke, that the value of CC will be zero when single-authored papers dominant. This implication shows that the higher the value of CC, means higher the probability of multi-authored papers.

##### 4.1.3. Modified Collaborative Coefficient (MCC)

CC differentiates single and multiple authors. But it fails to yield 1 for maximal collaboration except when a number of authors is infinite. It was rectified by Savanur and Srikanth, (2010) by the factor  $(1 - 1/A)$  with CC and enunciated as

$$MCC = (A/A-1) * \left\{ 1 - \frac{\sum_{j=1}^A (1/j) f_j}{N} \right\}$$

##### 4.1.4. Collaboration Index (CI)

Collaboration Index has been calculated by using the formula given by Lawani (1980). The Collaboration Index (CI) is the simplest index presently used to explore the literature, which is to be interpreted as the mean number of authors per paper.

$$CI = \frac{\sum_{j=1}^A j f_j}{N}$$

Where,

$f_j$  is the number of  $J$  authored papers published in discipline during a certain period of time

$N$  is the total number of research papers published in discipline during a certain period of time

##### 4.1.5. Co-authorship Index

Schubert and Braun (1986) elaborated CAI for the first time. Garg and Padhi (1999) suggested formula to computer CAI

$$CAI = \frac{N_{ij}/N_{io}}{N_{oj}/N_{oo}} * 100$$

Where

$N_{ij}$  = Number of publications having  $j$  author for a particular block

$N_{io}$  = Total output for the particular block

$N_{oj}$  = Number of papers having  $j$  authors for all blocks

$N_{oo}$  = Total number of papers for all authors and all blocks

$CAI = 100$  The number of publications corresponds to the average within a co-authorship pattern.

$CAI > 100$  The number of publications are higher than the average

$CAI < 100$  The number of publications are lower than the average

#### 4.1.6. Activity Index

The activity index has been counted by the formula which is suggested by Schubert and Braun (1986) as given below:

$$AI = \{(I_i/I_o) / (W_i/W_o)\} \times 100$$

Where,

$I_i$  = Particular Country's output in the year  $i$

$I_o$  = Total output of the country

$W_i$  = World output in the year  $i$

$W_o$  = Total output

### 5. Data Analysis

#### Objective 1: To Identify the Authorship Pattern in the Field of Jaundice literature from SAARC Countries

Table 1 provides the authorship pattern for the four block periods of 5 years each. The number of authors ranges from 1 to 23. Most of the articles have been produced by multiple authors. Total 1027 (98%) publications were published in co-authorship whereas only 21(2%) in single authorship. In multiple-authorship, the highest number of publications (184) is a

Block Years	Number of Authors										More than	Total Articles
	1	2	3	4	5	6	7	8	9	10		
1999 - 2003	3	7	23	15	22	13	6	8	2	2	1	102
2004 - 2008	3	28	38	36	43	35	9	6	8	3	6	215
2009 - 2013	11	51	61	66	68	45	32	20	9	6	9	378
2014 - 2018	4	37	61	67	51	44	28	23	1	11	12	353
Total Articles	21	12	18	18	18	13	75	57	3	22	28	1048
	3	3	4	4	7				4			

Table 1. Authorship Pattern

result of co-authorship between four authors and five authors followed by three authors (183) and the collaboration has gone up to 23 authors having one publication in the year block 2009- 2013. The total numbers of publications have been increasing in each block period except in the block 2014-2018. But Number of articles in the recent decade increased by more than twice (353) as compared to the first decade (102).

**Objective 2: To Determine the Magnitude of Collaborative Measures**

Degree of collaboration, Collaborative Index, Modified collaborative co-efficient, and Collaboration co-efficient for each block year is shown in table 2 and figure 1. DC, CC, MCC, and CI are calculated using the formulas mentioned in the methodology “a”, “b”, “c” and “d” respectively.

Block Years	Single-Authored Paper	Multi-Authored Paper	Total	DC	CI	CC	MCC
1999 - 2003	3	99	102	0.97	4.83	0.73	0.74
2004 - 2008	3	212	215	0.99	4.82	0.73	0.73
2009 - 2013	11	367	378	0.97	4.85	0.72	0.72
2014 - 2018	4	349	353	0.99	5.17	0.75	0.75
<b>Total</b>	21	1027	1048				
<b>Average</b>				0.98	4.92	0.73	0.74

Table 2. Collaboration Pattern

The block year 2014-2018 has the highest DC (0.99), CI (5.17), CC (0.75) and MCC (0.75). Again the DC reached highest having the same value in the block 2014-2018. The lowest DC (0.97) observed in the block 1999-2003 and 2009- 2013, lowest CI (4.82) observed in the year block 2004-2008, lowest CC (0.72) observed in the block 2009-2013 and lowest MCC (0.72) observed in the block 2009-2013. The overall value of the Degree of collaboration is 0.98, Collaborative co-efficient is 4.92, Collaboration co- efficient is 0.73 and the Modified collaboration co-efficient is 0.74. It is also observed that the value of CI gradually increased from the year 1999 to 2018.

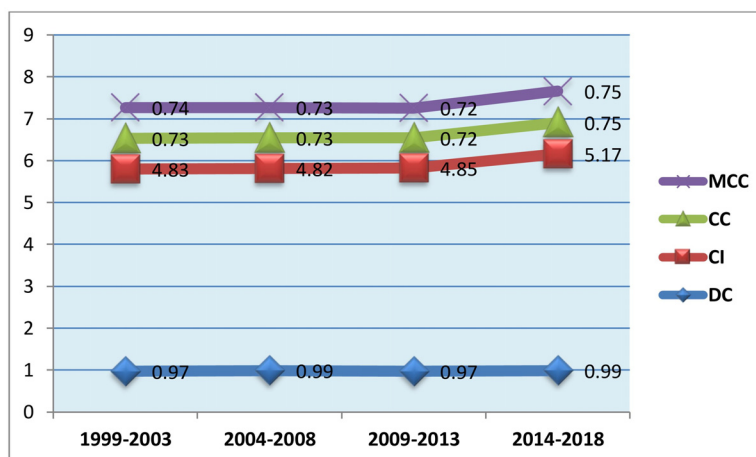


Figure 1. Collaboration Pattern

Table -3 specifies the calculated values of the Co-authorship Index (CAI) for publication having single author, two-authors, three authors, four authors, and more than four authors. For calculating the CAI, the formula mentioned in the “e” of the methodology part is used.

From table 3 we can see that the value of CAI for single authors has decreased from 146.78 to 56.55, which means there is a large decrease in the single authorship with respect to the overall output. In the case of double authorship, CAI has increased from 58.47 to 89.31. For three co-authors, it was above average in the 1999-2003 and 2004-2008 block with slightly less than the average value during 2009 -2013 and 2014-2018. In the case of four authors, it was below average for all the blocks except 2014 -2018. For more than 4 authors working in collaboration, value is more than average only during the last 5 years, in block 2014-2018. Highest collaborative effort has been observed among the single authors (146.78).

Block Years	Single-Authored Paper	CAI for 1 Author	Two-Authored Paper	CAI for 2 Author	Three-Authored Paper	CAI for 3 Author	Four-Authored Paper	CAI for 4 Author	Mega-Authored Paper	CAI for Maga Author	total output
1999 - 2003	3	146.78	7	58.47	23	129.13	15	83.76	54	103.31	102
2004 - 2008	3	69.63	28	110.96	38	101.22	36	95.37	110	99.84	215
2009 - 2013	11	145.23	51	114.96	61	92.42	66	99.45	189	97.57	378
2014 - 2018	4	56.55	37	89.31	61	98.96	67	108.10	184	101.72	353
<b>Total</b>	21		123		183		184		537		1048

Table 3. Co-authorship Index (CAI)

### Objective 3: To Find out the Activity Index of the SAARC Countries

Table-4 and figure-2 represent the activity index of the publications during the study period 1999-2018. The activity index calculated on the basis of publication published by SAARC countries on the topic “Jaundice”. The Activity index is calculated using the formula mentioned in methodology “f”. Activity index defines the relative research efforts in a given field of research. The highest activity index for India was 113.33 as found in year block 1999-2003, for Sri Lanka it was found as 166.35 in 2009-2013, for Bangladesh it was found as 141.85 in the block 2009-2013, for Pakistan it was found as 144.64 in the block 2014-2018 and for Nepal it was found as 205.49 in the block 1999-2003.

Block Years	India	AI for India	Sri Lanka	AI for Sri Lanka	Bangladesh	AI for Bangladesh	Pakistan	AI for Pakistan	Nepal	AI for Nepal	Total output
1999 - 2003	92	113.33	1	102.75	0	0	7	46.10	2	205.49	102
2004 - 2008	181	105.78	0	0.00	6	68.02	26	81.24	4	194.97	215
2009 - 2013	302	100.39	6	166.35	22	141.85	47	83.53	1	27.72	378
2014 - 2018	259	92.19	3	89.07	15	103.56	76	144.64	3	89.06	353
	834		10		43		156		10		

Table 4. Activity Index

### Objective 4: To discover the impact of the articles over the years

A citation shows the quantitative impact of an article as researchers cite relevant documents in their studies. The indicator

Citations per Paper (CPP) is used to find out the impact of the articles. Table 4 and Figure 3 show the citation impact of the articles in which, the block year 1999 -2003 has total paper 102, total citations 2418 and citations per paper is 23.7. In the block 2004-2008 has total papers 215, total citations 5133 and citations per paper is 23.9. Block 2009-2013 has total papers 378, total citations 4868 and citations per paper is 12.9. In block 2014-2018 has total papers 353, total citations 2355 and citations per paper is 6.7.

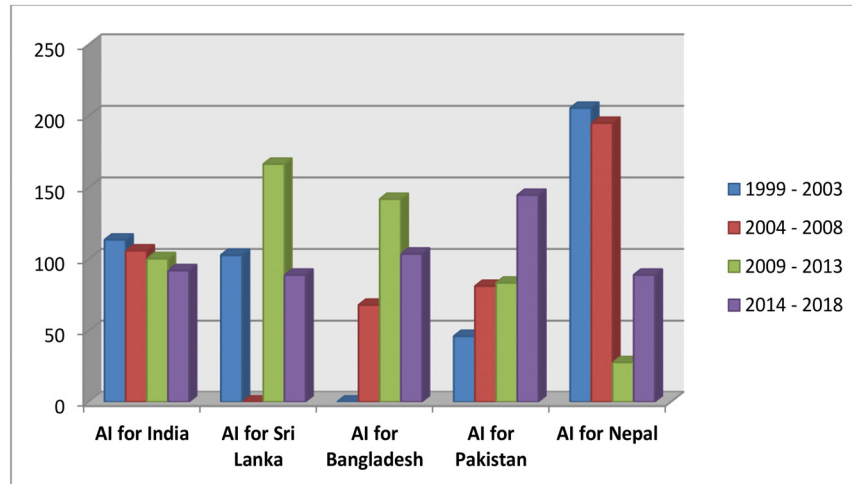
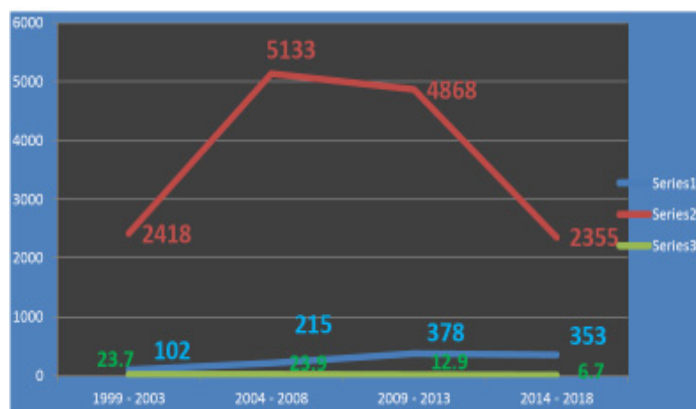


Figure 2. Activity Index

Block Years	TP	TC	CPP
1999 - 2003	102	2418	23.7
2004 - 2008	215	5133	23.9
2009 - 2013	378	4868	12.9
2014 - 2018	353	2355	6.7

(Note: TP = Total Paper, TC = Total Citation, CPP = Citation per Paper)

Table 4. Citation Impact of articles



(Note: Series 1 = TP, Series 2 = TC, Series 3 = CPP)

Figure 3. Citation Impact of articles

Table 5 further categorizes the impact of the articles according to the authorship pattern. It is found that the CPP of multiple authors is greater than the CPP of single authors in most of the blocks except for the block of years 2009 – 2013. It provides evidence that multiple-authored papers receive more citations than that of single-authored papers.

Block Years	Total Paper		Total Citation		CPP	
	Single	Multiple	Single	Multiple	Single	Multiple
1999 - 2003	3	99	58	2360	19.3	23.8
2004 - 2008	3	212	52	5081	17.3	24.0
2009 - 2013	11	367	151	4717	13.7	12.9
2014 - 2018	4	349	4	2351	1.0	6.7

Table 5. CPP according to authorship pattern

## 6. Conclusion

From the study is concluded that out of 1048 papers total of 1027 (98%) publications was published in co-authorship, whereas only 21(2%) in single authorship. The total number of publications has been increasing in each block period except in the block 2014-2018. The block year 2014-2018 has the highest DC (0.99), CI (5.17), CC (0.75) and MCC (0.75). Again the DC reached highest having the same value in the block 2014- 2018. The value of CAI for single authors has decreased from 146.78 to 56.55, which means there is a large decrease in the single authorship with respect to the overall output. The highest activity index for India was 113.33 found in year block 1999-2003, for Sri Lanka it was found as 166.35 in 2009-2013, for Bangladesh it was found as 141.85 in the block 2009-2013, for Pakistan it was found as 144.64 in the block 2014-2018 and for Nepal, it was found as 205.49 in the block 1999-2003. In the block 2004-2008 has total papers as 215, total citations as 5133 and citations per paper is 23.9 which is the highest among all.

## References

- [1] Ajiferuke, I., Burell, Q., Tague, J. (1988). Collaborative coefficient: A single measure of the collaboration in research. *Scientometrics*, 14, 421-433. <https://link.springer.com/article/10.1007/BF02017100>
- [2] Biradar, N., & Tadasad, P. G. (2015). Authorship Patterns and Collaborative Research in Economics. *The Journal of Indian Library Association*, 51 (4) 21–29. <https://www.ilaindia.net/jila/index.php/jila/article/view/22/17>
- [3] Britannica, T. (n.d.). South Asian Association for Regional Co-operation. Retrieved from <https://www.britannica.com/topic/South-Asian-Association-for-Regional-Co-operation>
- [4] Doerr, S. (n.d.). What Causes Jaundice in Children & Adults? Treatments & Symptoms. Retrieved from [https://www.emedicinehealth.com/jaundice/article\\_em.htm#what\\_causes\\_jaundice](https://www.emedicinehealth.com/jaundice/article_em.htm#what_causes_jaundice)
- [5] Garg, K. C., Padhi, P. (2001). A study of collaboration in laser science and technology. *Scientometrics*, 51 (2) 415-427.
- [6] Jhamb, G., Meera, Singh, K. P. (2019). Indian geology research as reflected by Web of Science during 1998-2017. *COLLNET Journal of Scientometrics and Information Management*, 13 (1) 37–51. <https://doi.org/10.1080/09737766.2019.1568363>
- [7] Lawani, S. M. (1980). *Quality, collaboration and citations in cancer research: A bibliometric study* (Doctoral dissertation). Florida State University, Florida.
- [8] Mondal, D., Maity, A. (2019). Foreign Authorship Pattern in Selected Library and Information Science Journals of India. *DESIDOC Journal of Library & Information Technology*. 39 (1) 17-22. [10.14429/djlit.39.1.13691](https://doi.org/10.14429/djlit.39.1.13691)
- [9] Ramalingam, J., Elangovan, N. (2018). Measuring Co-Authorship Pattern in Research Output of Chromosome



Anomalies. *Library Philosophy and Practice (e-journal)*. 1730. <https://digitalcommons.unl.edu/libphilprac/1730>.

[10] Savanur, K., Srikanth, R. (2010). Modified Collaborative Coefficient: a new measure for quantifying the degree of research collaboration, *Scientometrics*, 84 (2) 365-371. <https://link.springer.com/article/10.1007/s11192-009-0100-4>

[11] Schubert, A., & Braun, T. (1986). Relative indicators and relational charts for comparative assessment of publication output and citation impact. *Scientometrics*, 9 (5-6), 281-291. <https://link.springer.com/article/10.1007/BF02017249>

[12] Subramanyam K. (1983). Bibliometric studies of research collaboration: A review. *Journal of Information Science*, 6 (1) 33-38. <https://doi.org/10.1177/016555158300600105>

[13] Yadav, S. K., Singh, S. N., Verma, M. K. (2019). Authorship and Collaboration Pattern in SRELS Journal of Information Management during 2008-2017: An Evaluation, *Library Philosophy and Practice (e-journal)*. 2119. <http://digitalcommons.unl.edu/libphilprac/2119>

[14] Yoda, N., Kuwashima, K. (2109). Triple Helix of University-Industry-Government Relations in Japan: Transitions of Collaborations and Interactions, *Journal of the Knowledge Economy*, <https://doi.org/10.1007/s13132-019-00595-3>.