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Analysis of Authorship Pattern and Collaborative Research in the field of Laparoscopic Surgery Literature

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ABSTRACT

This paper helps a bibliometric analysis of the authorship pattern and collaborative research in the field of Laparoscopic Surgery literature in the MEDLINE database which covered in PubMed throughout the years i.e. 2010 to 2019. The maximum number of 9118 publications was published in the year 2019. A total of 94.97% of publications are covered by multi-authors' papers. The ratio of single and multi-authors' contributions is 1:20 in the field of Laparoscopic Surgery. The year-wise Degree of Collaboration shows the ratio in-between 0.92 to 0.97 in the field of Laparoscopic Surgery. The study exposed that the multi-authors' papers are dominated in the field of Laparoscopic Surgery. The value of CAI for single-author papers was higher in the first block and declined in the second block in Laparoscopic Surgery literature. In the contrast, the CAI for more than two authors' papers was lower in the first block and enhanced in the second block period in Laparoscopic Surgery literature. This result shows that the teamwork in Laparoscopic Surgery research is in an increasing trend in recent years. The average CC has been arrived at 0.62 which also indicates large share of publications was by multiple authors.

Keywords: Bibliometrics, Laparoscopic Surgery, Degree of Collaboration (DC), Co-Authorship Index (CAI), and Collaborative Co-efficient (CC).

INTRODUCTION:

Laparoscopic surgery is a surgical technique in which short, narrow tubes are inserted into the abdomen through small incisions. Through these narrow tubes, long, narrow instruments are inserted. The surgeon uses these instruments to manipulate, cut, and sew tissue.¹ The publications that were published in the field of Laparoscopic Surgery were increased day by day since there are number of research in the field of Laparoscopic Surgery. So, it is required to study quantitatively the literature in the field of Laparoscopic Surgery. There are number of Bibliometric techniques were used by different researchers. But in this study the Bibliometric techniques i.e. Degree of Collaboration (DC), Co-Authorship Index (CAI), and Collaborative Co-efficient (CC) have been employed. These techniques help to study of authorship pattern or productivity in the field of Laparoscopic Surgery. It was aimed to examine the authorship pattern and collaborative research in the field of Laparoscopic Surgery with the help of bibliographic database namely MEDLINE which covered in PubMed. It is essential to concentrate in the area of authorship pattern to evaluate the research contributions in a field and Laparoscopic Surgery.

LITERATURE REVIEW:

A huge number of publications have been published in the area of authorship patterns or productivity in the bibliometric analysis. Maheswarappa and Nagappa² study was the Dynamics of scientific communications and the contributions analysis in Phytomorphology. Farahat³ investigated the authorship patterns in agriculture sciences in Egypt. Karisiddappa, Gupta, and Kumar⁴ study was the scientific productivity of authors in theoretical population genetics. Shirabe and Tomizawa⁵ examined the likelihood of overseas access to international co-authorships. Dutt, Garg, and Bali⁶

study was the scientometrics of the International Journal Scientometrics. Ramakrishnan, Ravisankar, and Thavamani also considered the authorship pattern and collaborative research in the field of Pediatric Vascular Surgery⁷ and Swine Flu Diseases.⁸

AIM OF THE STUDY

- To scrutinize the authorship pattern. i.e. Single Vs. Multiple authors in the field of Laparoscopic Surgery literature.
- To analyze the Degree of Collaboration (DC) in Laparoscopic Surgery literature.
- To examine the Co-Authorship Index (CAI) in Laparoscopic Surgery literature.
- To observe the Collaborative Co-efficient (CC) in Laparoscopic Surgery literature.

METHOD USED FOR THIS STUDY

The publications published in the MEDLINE data from the year 2010 to 2019 in the field of Laparoscopic Surgery which are covered in the PubMed⁹ were searched and important details were collected. The retrieved publications details were loaded in SPSS for the purpose of analysis. The keyword 'Laparoscopic Surgery' was used to save the publications details available in the above-said database. The publications details retrieved from the source database on the literary production of 'Laparoscopic Surgery' have been analyzed by using bibliometric techniques i.e. Degree of Collaboration (DC)¹⁰, Co-Authorship Index (CAI)¹¹, and Collaborative Co-efficient (CC).¹²

LITERATURE PUBLISHED IN LAPAROSCOPIC SURGERY

It is observed that the research productivity in the field of Laparoscopic Surgery covered 77934 of the publications in the MEDLINE database for a period of ten years i.e. from the year 2010 to 2019. The year-wise publications of literature in the field of Laparoscopic Surgery are presented in Table-1. The maximum number of 9118 publications was published in the year 2019, followed by 8717 publications in the year 2017 and 8605 publications in the year 2016. It is also seen that from the year 2010 onwards there is a steady increase in Laparoscopic Surgery research productivity every year except the year 2018. (Figure-1)

Table 1: Literature published in Laparoscopic Surgery by year wise

S.No.	Year	No. of Publications	%	Cumulative No. of publications	Cumulative %
1	2010	5265	6.76		
2	2011	6862	8.80	12127	15.56
3	2012	7117	9.13	19244	24.69
4	2013	7510	9.64	26754	34.33
5	2014	7944	10.19	34698	44.52
6	2015	8396	10.77	43094	55.30
7	2016	8605	11.04	51699	66.34
8	2017	8717	11.19	60416	77.52
9	2018	8400	10.78	68816	88.30
10	2019	9118	11.70	77934	100.00
Total		77934	100.00		

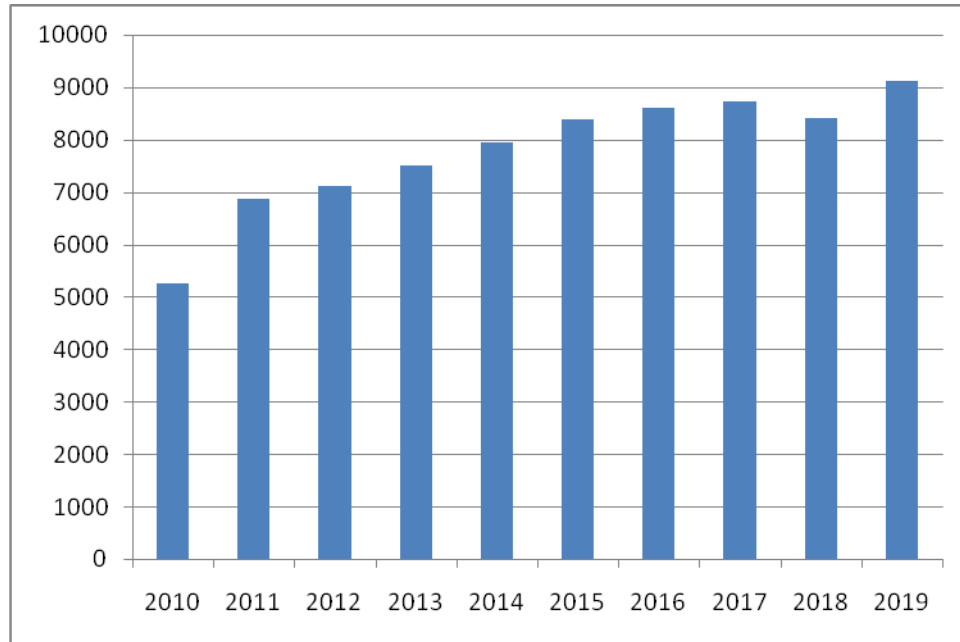


Figure1: Literature published in Laparoscopic Surgery by year wise

AUTHORSHIP PATTERN

This paper has attempted to examine the Extent of authorship pattern. i.e. Single Vs. Multiple authors, Degree of Collaboration (DC), Pattern of Co-Authorship Index (CAI), and Collaborative Co-efficient (CC).

Single Vs Multiple Authors

The output of Laparoscopic Surgery literature has been presented in the table-2 from the year 2010 to 2019. The year-wise distribution of contributions according to the number of authors is presented. It is presented from the Table-2 that 4.79% of the publications were by single authorpublications.94.97% represent two and more authors' publications, which reveal that the collaborative research is evident in the Laparoscopic Surgery literature (Figure-2).

Table 2: Authorship pattern in Laparoscopic Surgery

Authors	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	No. of Publications	%
Single Author	413	454	446	375	405	414	334	321	284	289	3735	4.79
Two Authors	601	686	634	720	703	676	714	641	670	675	6720	8.62
Three Authors	728	988	905	978	1046	989	1016	959	873	1016	9498	12.19
Four Authors	769	1008	1050	1050	1085	1115	1176	1158	1089	1083	10583	13.58
Five Authors	782	941	1063	1051	1066	1158	1092	1170	1125	1177	10625	13.63
> Five Authors	1954	2775	3004	3322	3617	4031	4259	4449	4332	4845	36588	46.95
Anonymous	18	10	15	14	22	13	14	19	27	33	185	0.24
Total	5265	6862	7117	7510	7944	8396	8605	8717	8400	9118	77934	100.00

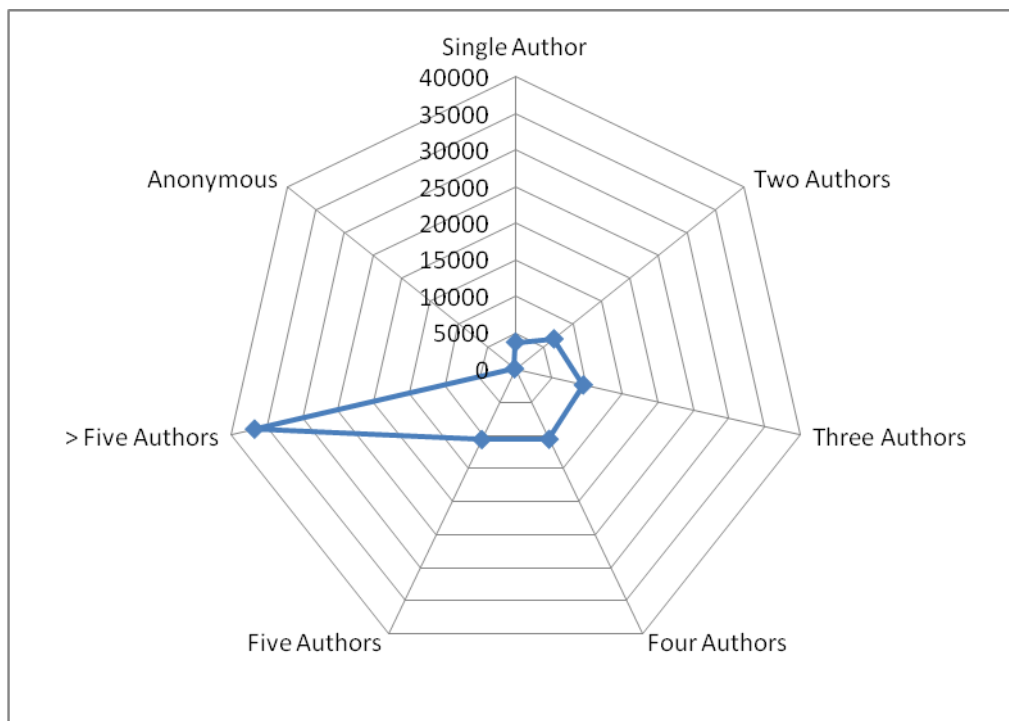


Figure 2: Authorship Pattern of Laparoscopic Surgery Literature

Table-3 shows that the authorship pattern of research output of Laparoscopic Surgery literature. As already mentioned that the multi-authors' papers found the major percentage. A total of 94.97% of publications are written by multi-authors. The ratio of single and multi-authors 'publications is 1:20 found in the field of Laparoscopic Surgery. But, it was seen that meager percent (0.23%) represent anonymous authorship. The high occurrence by multi-authors' publications is the phenomenon of scientific research. (Figures-3, and 4).

Table 3: Single Vs Multi Authored publications in Laparoscopic Surgery Research

Year	Anonymous		Single Authored		Multi Authored		Total	%
	Papers	%	Papers	%	Papers	%		
2010	18	9.73	413	11.06	4834	6.53	5265	6.76
2011	10	5.41	454	12.16	6398	8.64	6862	8.80
2012	15	8.11	446	11.94	6656	8.99	7117	9.13
2013	14	7.57	375	10.04	7121	9.62	7510	9.64
2014	22	11.89	405	10.84	7517	10.16	7944	10.19
2015	13	7.03	414	11.08	7969	10.77	8396	10.77
2016	14	7.57	334	8.94	8257	11.16	8605	11.04
2017	19	10.27	321	8.59	8377	11.32	8717	11.19
2018	27	14.59	284	7.60	8089	10.93	8400	10.78
2019	33	17.84	289	7.74	8796	11.88	9118	11.70
Total	185	100.00	3735	100.00	74014	100.00	77934	100.00

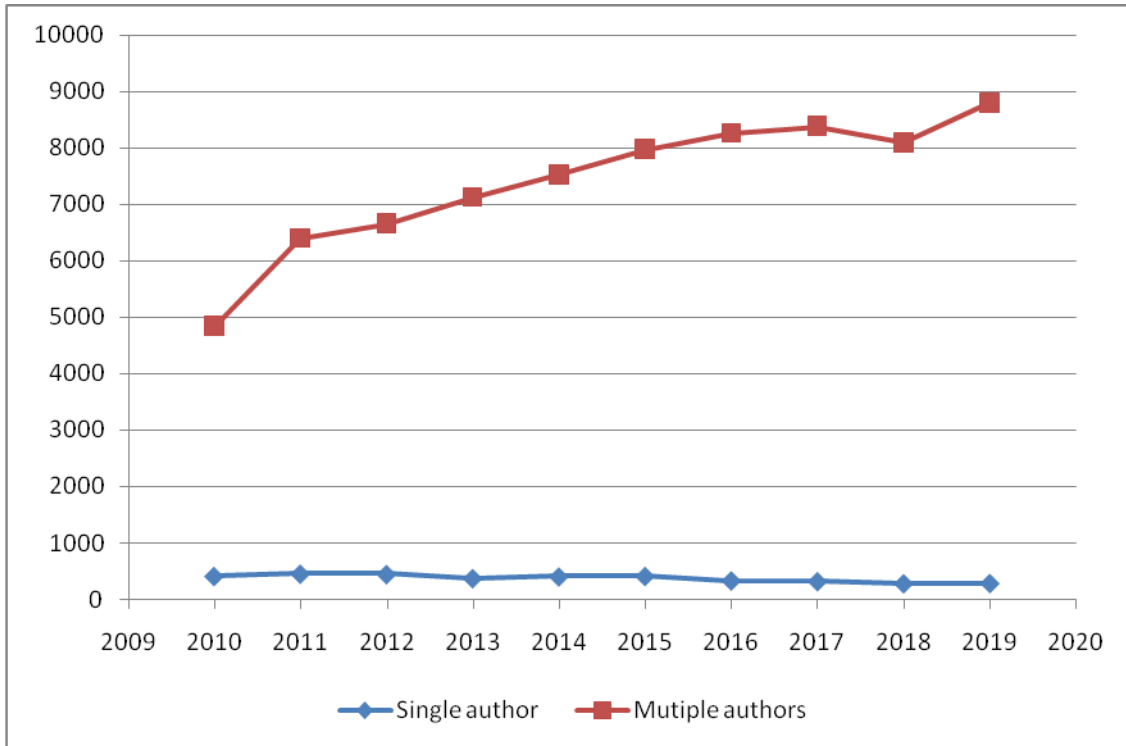


Figure 3: Single Vs. Multi authored publications in Laparoscopic Surgery Research

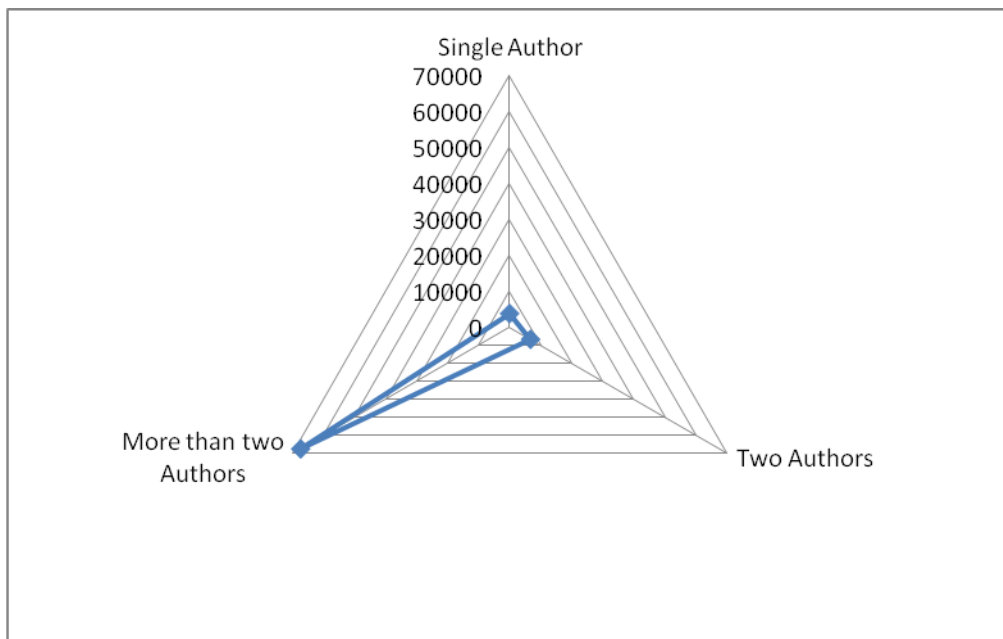


Figure 4: Authorship Pattern in Laparoscopic Surgery

Degree of Collaboration in Laparoscopic Surgery Research:

The Degree of Collaboration of authors by year-wise is presented in Table-4. The Degree of Collaboration in the field of Laparoscopic Surgery has been measured with the help of the formula created by K. Subramaniam. Therefore, the Degree of Collaboration has been considered for the year 2010 is as follows:

$$C = \frac{4834}{4834 + 413} = \frac{4834}{5247} = 0.92$$

Similarly, the Degree of Collaboration is considered for every year and presented in Table-4. It is seen from the table that the year-wise Degree of Collaboration shows the ratio in-between 0.92 to 0.97 in the study of the degree of collaboration in the field of Laparoscopic Surgery. (Fig.5). At the same time the year-wise Degree of Collaboration falls more than 0.5 and exposed that the multi-authors' papers are dominated in the field of Laparoscopic Surgery.

Table 4: Degree of Collaboration in Laparoscopic Surgery Research

Year	Anonymous	Single author	Two authors	Three Authors	Four Authors	Five Authors	More than Five author	Total	More than one author	Degree of Collaboration
2010	18	413	601	728	769	782	1954	5265	4834	0.92
2011	10	454	686	988	1008	941	2775	6862	6398	0.93
2012	15	446	634	905	1050	1063	3004	7117	6656	0.94
2013	14	375	720	978	1050	1051	3322	7510	7121	0.95
2014	22	405	703	1046	1085	1066	3617	7944	7517	0.95
2015	13	414	676	989	1115	1158	4031	8396	7969	0.95
2016	14	334	714	1016	1176	1092	4259	8605	8257	0.96
2017	19	321	641	959	1158	1170	4449	8717	8377	0.96
2018	27	284	670	873	1089	1125	4332	8400	8089	0.97
2019	33	289	675	1016	1083	1177	4845	9118	8796	0.97
Total	185	3735	6720	9498	10583	10625	36588	77934	74014	0.95

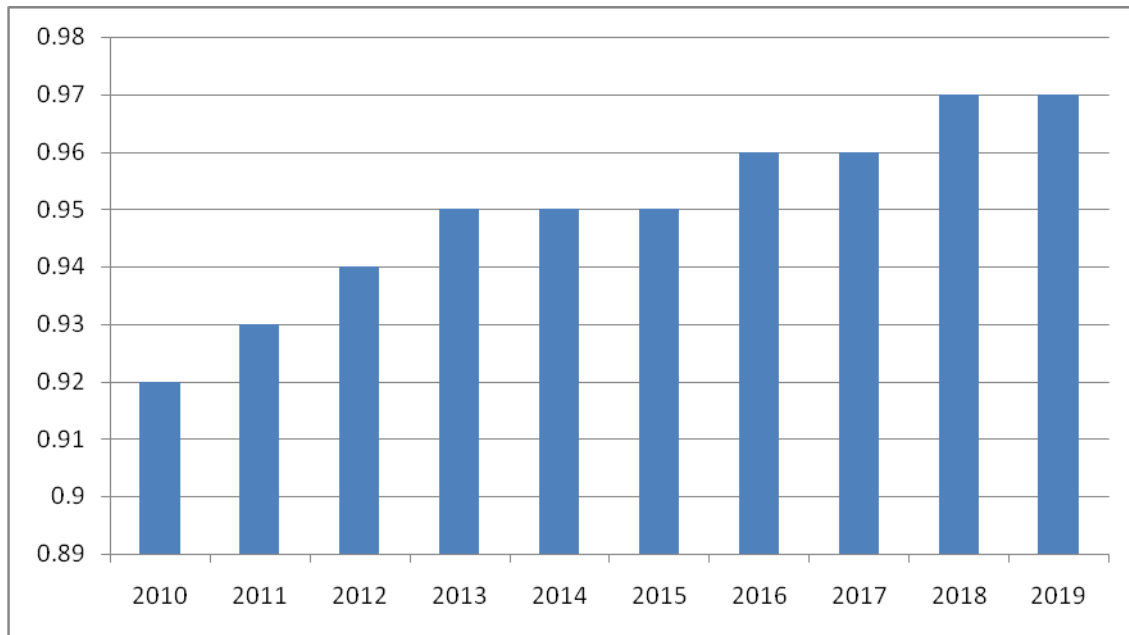


Figure 5: Degree of Collaboration in Laparoscopic Surgery Research

The Pattern of Co-Authorship Index (CAI)

To study how the patterns of co-authors have changed from the year 2010 to 2019, the formula of Co-Authorship Index (CAI) has been employed for this study. For the purpose of calculating CAI the entire data set was divided into two blocks. Therefore, the Co-Authorship Index (CAI) has been considered for the single author (first block) as follows:

$$\text{CAI} = \{(2093/34619) / (3735/ 77749)\} * 100$$

$$\text{CAI} = \mathbf{125.85}$$

Similarly, the Co-Authorship Index (CAI) is calculated for every block and presented in Table-5. For calculation of CAI, the entire publications were divided into two blocks as per the formula and the results of CAI are given in Table-5. It is witnessed from the Table-5 that the value of CAI for single-author papers from the year 2010 to 2014 was higher (125.85) in the first block and declined in the second block. Similarly,

for two-author's publications, the CAI in the first block i.e. from the year 2010 to 2014 was 111.76 and declined in the second block. The CAI for more than two authors' publications was lower (97.39) in the first block and enhanced to 102.09 in the second block period i.e. from the year 2015 to 2019. This shows that the teamwork in Laparoscopic Surgery research is in an increasing trend in recent years. (Fig.6)

Table 5: Pattern of Co-Authorship Index (CAI) by Year-wise

Sl.No.	Year	Single Author	Two authored	More than Two authors	Total
1	2010-2014	2093 (125.85)	3344 (111.76)	29182 (97.39)	34619
2	2015-2019	1642 (79.25)	3376 (90.56)	38112 (102.09)	43130
Anonymous					185
Total		3735	6720	67294	77934

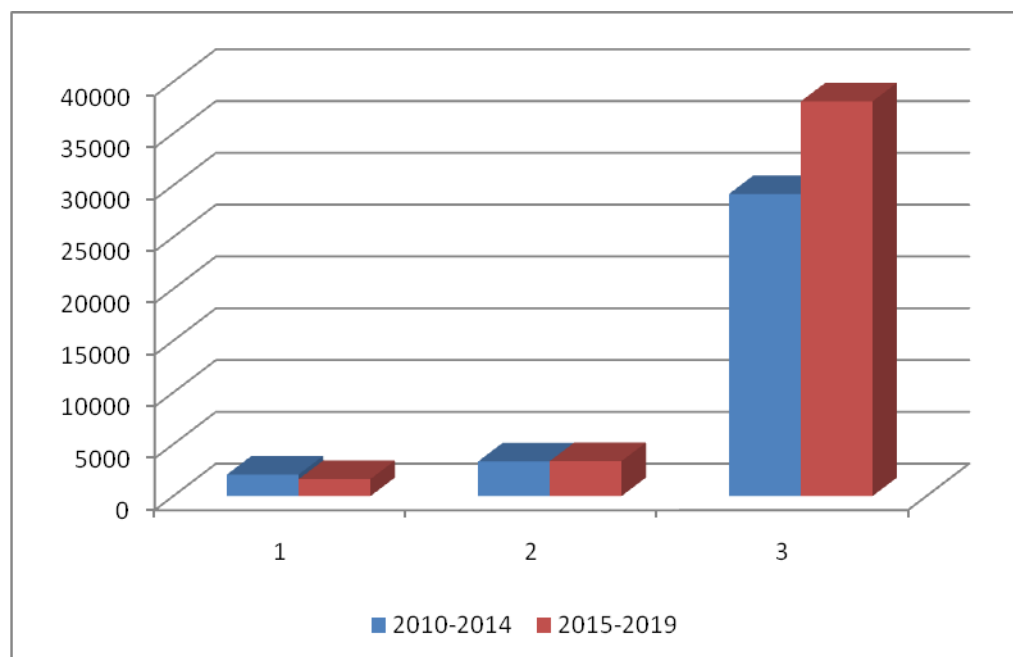


Figure6: Pattern of Co-Authorship Index (CAI) by Year-Wise

Pattern of Co-Authorship among countries

To scrutinize the pattern of co-authorship, the entire publications were divided into single, two and more than two authors for each country and the results presented in the Table 6. The pattern of co-authorship among different countries has been studied by making use of collaborative Co-efficient (CC) suggested by Ajiferuke³¹. The formula employed for calculating CC is given below:

$$CC = 1 - \left[\sum_{j=1}^k (1/j) F_j / N \right]$$

F_j = the number of authored papers

N = total number of research published; and

k = the greatest number of authors per paper

$$\begin{aligned} CC &= 1 - [(1568/24907) + \frac{1}{2} (2360/24907) + \frac{1}{3} (20979/24907)] \\ &= 0.61 \end{aligned}$$

According to Ajiferuke, the CC tends zero as single authored publications dominate, and on the other hand if the CC is in increasing trend that results in multi authored publications. In other words, higher the value of CC, greater the probability of multi authored publications in the field of Laparoscopic Surgery. In this study it is seen that the average CC has been arrived at 0.62 which indicates large share of publications were by multiple authors. The value of CC for Tunisia and Portugal was highest (0.67 each) followed by Greece, Argentina, Croatia, and Slovakia (0.66 each) and this is followed by Ireland, Iran, Singapore, and Chile (0.65 each). The other countries in the table-6 have also above the cc value of 0.50 except the country Georgia (Republic) (0.47) where the CC is below 0.5. In other words, the countries showing

CC as above 0.5 indicates that those countries have better collaboration in comparison to the countries with less than 0.5 as shown in the Table 6.

Table 6: Collaborative Coefficient (CC) Authorship Pattern

Sl. No.	Country	Single authored paper	Two authored paper	More than Two authors	Total	Collaborative Coefficient
1.	United States	1568	2360	20979	24907	0.61
2.	Germany	272	563	7851	8686	0.63
3.	England	423	627	6427	7477	0.61
4.	Japan	88	111	2719	2918	0.64
5.	Italy	50	158	1586	1794	0.63
6.	China	75	176	1407	1658	0.62
7.	France	93	163	1330	1586	0.61
8.	Australia	118	146	1117	1381	0.59
9.	Netherlands	68	150	1111	1329	0.61
10	Switzerland	77	130	1015	1222	0.61
11	Spain	49	66	953	1068	0.63
12	Ireland	10	22	562	594	0.65
13	Russia (Federation)	22	52	425	499	0.62
14	Greece	1	17	437	455	0.66
15	Brazil	8	22	325	355	0.64
16	Poland	18	25	255	298	0.61
17	Romania	17	24	226	267	0.61
18	Mexico	10	13	243	266	0.63
19	India	22	28	194	244	0.59
20	Denmark	24	42	171	237	0.57
21	Canada	9	20	176	205	0.62
22	Pakistan	15	33	155	203	0.59
23	Czech Republic	15	14	170	199	0.60
24	Turkey	3	15	169	187	0.64
25	China (Republic : 1949-)	5	14	165	184	0.64
26	Ukraine	27	26	123	176	0.54
27	Iran	2	7	139	148	0.65
28	Scotland	9	12	112	133	0.61

29	Singapore	0	12	109	121	0.65
30	Hungary	23	16	77	116	0.51
31	Thailand	7	11	81	99	0.60
32	Bulgaria	3	9	59	71	0.62
33	Nepal	9	15	38	62	0.53
34	Israel	1	4	53	58	0.64
35	Belgium	1	3	48	52	0.64
36	Korea (South)	4	9	39	52	0.59
37	Tunisia	0	0	52	52	0.67
38	South Africa	6	6	39	51	0.57
39	New Zealand	8	5	36	49	0.54
40	Serbia	5	2	41	48	0.59
41	Argentina	0	1	36	37	0.66
42	Croatia	0	1	37	38	0.66
43	Bangladesh	2	5	26	33	0.60
44	Sweden	3	4	22	29	0.57
45	Saudi Arabia	2	2	24	28	0.61
46	Chile	0	2	24	26	0.65
47	Nigeria	2	6	15	23	0.57
48	Peru	0	3	20	23	0.64
49	Portugal	0	0	22	22	0.67
50	Austria	1	1	19	21	0.63
51	Georgia (Republic)	5	4	11	20	0.47
52	Slovakia	0	1	19	20	0.66
53	United Arab Emirates	1	4	15	20	0.60
	Other countries	8	22	137	167	0.61
	Not Mentioned	546	1536	15653	17735	0.63
	Anonymous				185	
	Total	3735	6720	67294	77934	0.62

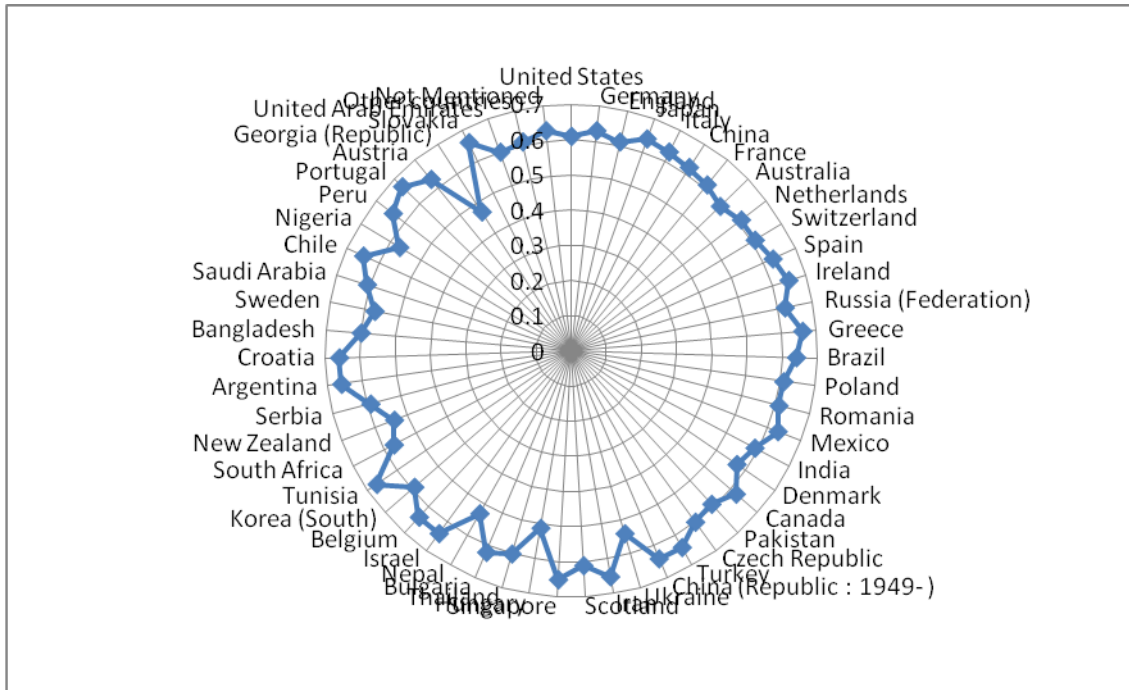


Figure 7: Collaborative Coefficient (CC) Authorship Pattern

MAJOR FINDINGS

- It is found that there are 77934of publications in the field of Laparoscopic Surgery literature.
- The maximum number of 9118publications was published in the year 2019in the field of Laparoscopic Surgery literature.
- A total of 0.24% of publications represents anonymous authorship in the field of Laparoscopic Surgery literature.
- 94.97% of publications were two and more authors from the year 2010 to 2019 of study.
- The ratio of single and multi-authors' papers is 1:20in the field of Laparoscopic Surgery literature.

- The year-wise Degree of Collaboration shows the ratio in-between 0.92 to 0.97 in the field of Laparoscopic Surgery literature.
- The value of CAI for single-author papers was 125.85 in the first block i.e. from the year 2010 to 2014 was higher and declined in the second block.
- Similarly, for two author's papers, the CAI was 111.76 in the first block i.e. from the year 2010 to 2014 and declined in the second block.
- The CAI for more than two authors' papers was less (97.39) in the first block and enhanced to 102.09 in the second block period i.e. from the year 2015 to 2019.
- The average CC has been arrived at 0.62 which indicates large share of publications was by multiple authors.
- The total study exposed that the multi-authors' papers are lead in the field of Laparoscopic Surgery literature.
- It also shows that the teamwork in Laparoscopic Surgery research is in increasing trend in recent years.

CONCLUSION

A total of 94.97% contributions represent collaborative research. The Degree of Collaboration has arrived at the value of 0.95 during the study period. The value of the Co-Authorship Index (CAI) for single-author contributions and two authors' contributions show a declining trend from one block year period to another block. On the other hand, for more than two authors' papers, the Co-Authorship Index reveals an increasing trend. It shows that the recent years the collaboration of authors was increased.

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