

## **A Study of Authorship Pattern and Collaborative Research in Journal of Research in Ayurvedic Sciences**

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**Abstract:** *The purpose of this study is to investigate the authorship pattern and collaborative research in the Journal of Research in Ayurvedic Science for selected fifteen years from 2000 to 2014. The study also investigated the year-wise distribution of publication, growth of authorship, volume and issue-wise authorship pattern, author's productivity, single and multi-authored papers, and degree of collaboration research in the Journal of Research in Ayurvedic Science. The quantitative data were collected through observation from Journal of Research in Ayurvedic Sciences websites and also available in the online archival repository. It was found that the highest number of contributions, i.e., 34 (11%), were published in 2008, and the lowest number of contributions, i.e., 8 (2.59%), were published in 2012 and 2013. In 2010, the highest number of authors with a productivity of 109 (3.41) was published. The lowest number of authors' productivity (26, or 3.25), was published in the year 2013. The degree of collaboration in this journal is 0.91.*

**Keywords:** Authorship Pattern; Bibliometrics; Scientometric Analysis; Degree of collaboration; Journal of Research in Ayurvedic Sciences.

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## Introduction

**Bibliometrics:** According to Alan Pritchard the term “Bibliometrics” as “The Application of mathematics and statistical methods to books and other media of communication; Methodology of the information transfer process and its purpose is to analysis and control of the process.

Sengupta defines bibliometrics more explicitly as “Organization, classification and quantitative evaluation of publication patterns of all macro and micro communication along with their authorships by mathematical and statistical calculus”

**Scientometrics:** Scientometrics is a formed structural part of science including the complex of mathematical and statistical methods, used to analyze the quantitative characteristics of science as an enterprise (Veverience, 1994). Many types of scientometrics data can be presented as transaction matrix. In all cases the matrix consist of a set of items assigned to each row and column with each cell containing the level of transaction between the row and column items (Kretschmer, 1994)

**Scientometric Analysis:** Several quantitative characteristics of scientific change have been treated in scientometric investigation with the help of analysis models as well as empirical techniques citation and text the analysis sets of scientometric indicators (Elkana, 1978).

The objective of scientometrics as: “To evaluate quantitatively recent growth of any basic scientific discipline, and the factors responsible for the steady growth in research activity in that area of knowledge in the post-war period” (Sengupta, 1985).

Scientometrics study is a branch of bibliometrics. It is an important research tools for understanding the subjects. It aims at measuring the utility of documents and relationships between documents and fields (Khaparde, 2013).

## Journal of Research in Ayurvedic Sciences

The Central Council for Research in Ayurvedic Sciences (CCRAS), established in 1962, is an autonomous body under the Ministry of Ayush, Govt. of India. It acts as an apex body in India for coordinating, formulating, understanding, promoting, and developing research on scientific lines in the ayurvedic sciences. This council is publishing three journals, namely the Journal of Drug Research in Ayurvedic Sciences (JDRAS), the Journal of Research in Ayurvedic Sciences (JRAS), and the Journal of Indian Medical Heritage (JIMH).

Journal of Research in Ayurvedic Sciences (JRAS) is a peer-reviewed, open-access, UGC-CARE-listed journal. The journal is published quarterly and is available in both print and online forms. It is a multidisciplinary platform for the publication of research in Ayurveda, Yoga, Naturopathy, Siddha, and Homoeopathy fields, including interdisciplinary health sciences. JRAS is primarily devoted to research in Ayurveda, the Indian traditional health care system. The journal has been published online and has constantly contributed by publishing evidence-based research on traditional Indian systems of medicine. The thrust area for publication includes safety and efficacy studies, fundamental research, health promotion and preventive medicine, medico-social aspects including medical anthropology, epidemiological studies, health-related demography, the development of methodologies for clinical research, pharmacovigilance and pharmaco-epidemiology, integrative medicine, research protocols, meta-analytical studies, technical reports of projects, book reviews, and insightful literature reviews. The full text of the article is available online at <https://journals.lww.com/jras/pages/default.aspx> and articles of JRAS (1980-2014) are available in archived though online from 1980.

### **Review of Related Literature**

The number of authors contributing to scholarly publications in terms of authorship pattern is an instructing part of any bibliometric study. A count of number of authors contributing to articles offers some indication to degree of collaboration between authors (Khaparde, V. & Pawar, S. (2013). It was found that various studies were conducted on the authorship pattern and collaborative research in different disciplines. Some of the literatures were reviewed and mentioned before the current study.

**Pandit, P.J., & Sonawane, S.S. (2019)** conducted a study on trends in authorship pattern and author's collaborative research in Knowledge organization with a sample of 908 articles collect from LISA during 1991-2000. It was found that English 796 (87.67 %) is the most important language, the contribution of research articles highest number 153(16.85%) in the year 2000. The study reveals that single authorship research in predominant as compare to number of articles is written by multi authors. The study also reveals that the degree of collaboration (C) during the overall 10 years (1991-2000) is 0.27. 10 years of period the multi authored articles 62 (6.83%) are highest in the year 2000. **Yadav, S. K., & et al (2019)** conducted a study on evaluation of authorship and collaboration pattern in SRELS Journal of Information Management during

2008-2017. The study counted that the average collaboration index is 1.86, average collaboration coefficient is 0.36, average degree of collaboration is 0.66, average relative growth rate is 0.32 and average doubling time is 3.40 during 2008-2017. **Neelamma, G. and Gavisiddappa, A. (2018)** highlights the authorship pattern and research collaboration in the area of Crystallography based on 45320 scholarly communications appeared in the Crystallography during 1989-2013. Study illustrates various significant aspects like types and trends of authorship, author productivity, degree of collaboration, collaborative index, Collaboration coefficient, Moderate Collaboration. **Thavamani K. and Velmurugan C, (2013)** explores the publication trends of scholarly papers in Annals of Library and Information Studies published from New Delhi. The study conducted with 310 contributions published in the journal during the year 2002 – 2012 and revealed that highest number of contributions i.e., 43 (13.87%) were published in the year 2010. Most of the contributions are by two authored i.e., 136 (43.87 %.). The degree of collaboration is determined as 0.65. **Amsaveni, N., et al (2013)** did the study of the authorship pattern and collaborative research in bioinformatics. The study found that the rate of increased in multiple authorship pattern mottled considerably with subject area. Totally 91655 authors were produced 17318 articles in this subject of bioinformatics. 9.77 percent of articles were single authors' contribution. 90.17 % of articles produced by collaborative authors. **Khaparde, V. & Pawar, S. (2013)** examine the trends in authorship pattern and author's collaborative research in Information Technology with a sample of 17917 articles collect from LISA during 2000-2009. The average number of authors per article is 1.80. In the study the degree of collaboration (C) during the overall 10 years (2000-2009) is 0.71. The study found that the researches in Information Technology are keep toward team research or group research rather than solo research.

The review of the above few studies shows that studies on authorship patterns and collaborative research have been done in different journals. Similar studies in the Ayurvedic Sciences research journal were not conducted. So, it is more meaningful to conduct this type of study to understand the collaborative research work in this field.

### **Objectives of the study**

The objectives of the present study are:

- To know the year and volume wise distribution of publication.
- To study the growth of authors by year.

- To examine the nature of authorship patterns by year and volume wise in JRAS
- To study the author's productivity.
- To know the single and multi authored in journal
- To determine the degree of collaboration in JRAS

### **Methodology**

The present study is based on 309 articles collected from 12 numbers of volumes of Journal of Research in Ayurvedic Sciences during the year 2000 to 2014. The quantitative data was collected from Journal of Research in Ayurvedic Sciences websites (<http://ccras.nic.in/content/journal-drug-research-ayurvedic-sciences-0>) during 15 years i.e. 2000 -2014. In this study all the information of articles and other related relevant data were collected and noted from the main website of JRAS. For each article, year& volume wise distribution of contribution, year wise growth of author, number of authorships, authorship productivity and single and multi-authored paper were noted down for the study. Then the data were organized, calculated, tabulated, analyzed and presented by using simple arithmetic and statistical method in order to arrive for its result.

### **Limitations**

This study is fully restricted to articles available in the online archival repository of the JRAS during the 15 years from 2000 to 2014. Moreover, this research work collects relevant data from the website. Hence, the relevant data is collected from secondary sources of information, and the conclusive result of this study fully depends on these online websites.

### **Analysis & Results**

**Table 1: Year & Volumewise distribution of Article**

<b>Sl no</b>	<b>Year</b>	<b>Volume</b>	<b>No. of Articles</b>	<b>% of Records</b>
1	2000	21	22	7.12
2	2001	22	23	7.44
3	2002	23	21	6.80
4	2003	24	22	7.12
5	2004	25	16	5.18

6	2005	26	16	5.18
7	2006	27	16	5.18
8	2007	28	26	8.41
9	2008	29	34	11.00
10	2009	30	32	10.35
11	2010	31	32	10.35
12	2011	32	24	7.77
13	2012	33	8	2.59
14	2013	34	8	2.59
15	2014	35	9	2.91
<b>Total</b>			<b>309</b>	<b>100</b>

Table 1 shows the year and volume-wise distribution of publications in the Journal of Research in Ayurvedic Sciences (JRAS) from 2000 to 2014. It indicates that the highest contribution of research articles was 34 (11%) in 2008. The minimum number, i.e., 8 (2.59%) articles, were published from 2012 to 2014.

**Table 2: Growth of Authors by Year**

Sl no	Year	No. of Authors	% of Records
1	2000	69	7.03
2	2001	67	6.83
3	2002	68	6.93
4	2003	54	5.50
5	2004	51	5.20
6	2005	57	5.81
7	2006	52	5.30
8	2007	69	7.03
9	2008	105	10.70
10	2009	106	10.80
11	2010	109	11.11
12	2011	90	9.17

13	2012	27	2.75
14	2013	26	2.65
15	2014	31	3.16
<b>Total</b>		<b>981</b>	<b>100</b>

Table 2 represents the year-wise growth of authors. The highest number of authors, i.e., 109 (11.11%), contributed in 2010 and the lowest number of authors, i.e., 26 (2.65%), contributed in 2013 out of a total of 981 contributions.

**Table 3: Authorship Pattern**

Sl no	No. of Authors	Total No. of Contributions	% of Records
1	Single Author	28	9.06
2	Two Authors	81	26.21
3	Three Authors	87	28.16
4	Four Authors	66	21.36
5	Five Authors	31	10.03
6	Six Authors	7	2.27
7	Seven Authors	4	1.29
8	Eight Authors	4	1.29
9	Nine Authors	1	0.32
<b>Total</b>		<b>309</b>	<b>100</b>

The detail about the author pattern of the article is representing in the table 3. It shows that among the 309 articles, 28 (9.06%) articles are written by single author, 81 (26.21%) articles are written by two authors, 87 (28.16%) articles are written by three authors, 66 (21.36%) articles are written by four authors, 31 (10.03%) articles are written by five authors, 7 (2.27%) articles are written by six authors, 4 (1.29%) articles are written by seven & eight authors and nine authors written only 1(0.32%) author. It is seen that multi authors are predominant, than single author.

**Table 4: Year & Volume wise Authorship Pattern**

Sl no	Year	Volume	Author per Article									Total No. of papers	Total No. of Authors
			One	Two	Three	Four	Five	Six	Seven	Eight	Nine		
1	2000	21	2	6	6	4	3	1	-	-	-	22	69
2	2001	22	2	7	9	1	4	-	-	-	-	23	67
3	2002	23	2	6	6	3	3	-	-	-	1	21	68
4	2003	24	2	12	6	-	2	-	-	-	-	22	54
5	2004	25	-	3	8	4	1	-	-	-	-	16	51
6	2005	26	1	4	2	6	2	-	-	1	-	16	57
7	2006	27	1	3	5	6	-	1	-	-	-	16	52
8	2007	28	8	5	7	3	2	-	-	1	-	26	69
9	2008	29	5	8	10	6	3	-	1	1	-	34	105
10	2009	30	3	10	3	12	1	1	1	1	-	32	106
11	2010	31	1	8	8	9	5	-	1	-	-	32	109
12	2011	32	-	2	10	7	3	1	1	-	-	24	90
13	2012	33	-	3	2	1	1	1	-	-	-	8	27
14	2013	34	1	1	3	2	-	1	-	-	-	8	26
15	2014	35	-	3	2	2	1	1	-	-	-	9	31
Total			28	81	87	66	31	7	4	4	1	309	981
Percentage (%)			9.06	26.21	28.15	21.35	10.03	2.26	1.29	1.29	0.32		

Table 4 represents the details about year and volume wise authorship pattern for the period 2000 to 2014. The table shows that the single author Contribution is 9.06%, two author's share is 26.21%, three author's share is 28.15%, four author's share is 21.35%, five author's contribution is 10.03%, six author's share is 2.26%, seven & eight author's share is 1.29%, and nine author's share is 0.32% of the total articles 309. It shows that multiple authored research articles have made major contribution in the field of Ayurvedic Sciences.

**Table 5: Author's Productivity**

Sl no	Year	Total no of Papers	No. of Authors	AAPP*	Productivity per Author
1	2000	22	69	3.14	0.32
2	2001	23	67	2.91	0.34
3	2002	21	68	3.24	0.31
4	2003	22	54	2.45	0.41
5	2004	16	51	3.19	0.31
6	2005	16	57	3.56	0.28
7	2006	16	52	3.25	0.31
8	2007	26	69	2.65	0.38
9	2008	34	105	3.09	0.32
10	2009	32	106	3.31	0.30
11	2010	32	109	3.41	0.29
12	2011	24	90	3.75	0.27
13	2012	8	27	3.38	0.30
14	2013	8	26	3.25	0.31
15	2014	9	31	3.44	0.29
<b>Total</b>		<b>309</b>	<b>981</b>	<b>3.20</b>	<b>0.32</b>

\*Average Author per paper (AAPP) = Number of authors/Number of papers.

Productivity per author = Number of papers/ Number of authors.

Table 5 shows the data related to the author's productivity. It shows that the total average number of authors per paper is 3.20 and average productivity per author is 0.32. The highest number of author's productivity 109 (3.41) was published in the year 2010. The lowest number of author's productivity 26 (3.25) was published in the year 2013.

**Table 6: Year wise single and Multiple Authored papers**

Sl no	Year	Single Authored		Multi Authored		Total	% of Records
		Papers	%	Papers	%		
1	2000	2	7.14	20	7.12	22	7.11
2	2001	2	7.14	21	7.47	23	7.44
3	2002	2	7.14	19	6.76	21	6.79
4	2003	2	7.14	20	7.12	22	7.11
5	2004	-	-	16	5.70	16	5.17
6	2005	1	3.57	15	5.34	16	5.17
7	2006	1	3.57	15	5.34	16	5.17
8	2007	8	28.57	18	6.41	26	8.41
9	2008	5	17.86	29	10.32	34	11.00
10	2009	3	10.71	29	10.32	32	10.35
11	2010	1	3.57	31	11.03	32	10.35
12	2011	-	-	24	8.54	24	7.76
13	2012	-	-	8	2.85	8	2.58
14	2013	1	3.57	7	2.49	8	2.58
15	2014	-	-	9	3.20	9	2.91
<b>Total</b>		<b>28</b>	<b>100</b>	<b>281</b>	<b>100</b>	<b>309</b>	<b>100</b>

Table 6 shows the details about the single and multiple authored paper published during 2000 to 2014. It shows that lowest number i.e., 1(One) of single author paper in the year 2005, 2006 & 2013 and higher number i.e., (8) of single author paper in the year 2007. There was no single author paper published in the year 2004, 2011, 2012 & 2014. Total 28 (9.06%) paper contributed by single author and 281 (90.93%) paper contributed by multiple authors out of 309 contributions.

**Table 7: Degree of Collaboration**

Sl no	Year	Single Authored Paper (N <sub>s</sub> )	Multiple Authored Papers (N <sub>m</sub> )	Total (N <sub>s</sub> + N <sub>m</sub> )	Degree of Collaboration
1	2000	2	20	22	0.90
2	2001	2	21	23	0.91
3	2002	2	19	21	0.90
4	2003	2	20	22	0.90
5	2004	-	16	16	1.00
6	2005	1	15	16	0.93
7	2006	1	15	16	0.93
8	2007	8	18	26	0.69
9	2008	5	29	34	0.85
10	2009	3	29	32	0.90
11	2010	1	31	32	0.96
12	2011	-	24	24	1.00
13	2012	-	8	8	1.00
14	2013	1	7	8	0.90
15	2014	-	9	9	1.00
<b>Total</b>		<b>28</b>	<b>281</b>	<b>309</b>	<b>0.91</b>

The table 7 shows the details about the degree of collaborations. Degree of collaboration is a prominent area of research in bibliometric studies which indicate tends in single and joint authorship during 2000 to 2014. The degree of collaboration ranges from 0.69 to 1.00 and the average degree of collaboration is 0.91. The degree of collaboration is calculated by using the following formula (K. Subramanyam, 1982):

The formula is where

C = Degree of Collaboration

$$C = \frac{N_m}{N_m + N_s}$$

N<sub>m</sub> = Number of multiple authors

N<sub>s</sub> = Number of Single authors

$$C = \frac{281}{281+28}$$

In the present study, the value of C is

$$C = 0.91$$

As a result, the degree of collaboration in the JRAS is 0.91, which clearly manifests the multi author contributions dominance over single contributions.

## Conclusion

The conclusion of the study of authorship pattern & collaborative research of 309 articles in Journal of Research in Ayurvedic Sciences of fifteen years from 2000 to 2014 in a manner of corresponding to the objective of the study. The number of articles contribution is variable throughout the study period. The highest contribution of research articles was 34 (11%) in 2008 and minimum number, i.e., 8 (2.59%) articles, were published from 2012 to 2014. The highest number of authors contributions in the year 2010, i.e., 109 (11.11%) and the lowest number in the year 2013 i.e., 26 (2.65%). The authorship pattern reveals a remarkable difference between the number of single author and multi authors. Very few numbers (9%) of article are written by single author and most of the article written by multi authors. It is found through this study that the flavor of collaborative research is high in ayurvedic science. The majority of contribution is written by three authors and lowest number contribution is written by nine authors. The total average number of authors per paper is 3.20 and average productivity per author is 0.32. The degree of collaboration of overall 15 years from 2000 to 2014 is 0.91.

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