

## AUTHORSHIP PATTERNS IN ENDOCRINOLOGY LITERATURE: A SCIENTOMETRIC STUDY

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### ABSTRACT -

The paper deals with the authorship pattern in the field of endocrinology based on the literature research output as reflected in the Web of Science (WoS) database during the period from 1992 to 2021. The study examined India's performance based on its publication output in endocrinology, using different scientometric indicators, such as authorship pattern, collaborative index, degree of collaboration, and highly productive Institutions in India. A total number of 9812 publications were retrieved. The data was analyzed using MS-Excel Spreadsheet and VOS viewer software. It was examined that the degree of collaboration reveals an increasing trend in the field. Mohan, V has published 359 papers with 30.31 average citations per paper and the collaborative index for universal level value is 5.38. The single-author papers have increased performance in scientific research activities.

**Keywords** - Authorship Pattern, Scientometric, Collaborative Index, Degree of Collaboration, Endocrinology, Prolific Journals, Research Productivity

### INTRODUCTION

Endocrinology is one of the important subjects of biomedical sciences. It focuses on the endocrine system. Infact endocrine system that is made up of several glands create and release hormones into the bloodstream. These are the body's chemical messengers. They carry information, instructions, and messages through the blood to organs, skin, muscles, and other tissues from one group of cells to another. Therefore, endocrinology is an important area in the field of medical science. Research in endocrinology has a great significance. Scientometrics is the study of the measurement of scientific and technological progress. The main focus of scientometrics is the quantitative aspects of science as a discipline including research evaluation and aspects of research policy.

Scientometrics Provides some preliminary assumptions about what science actually is and how a true scientific achievement is to be recognized, scientometrics ultimately addresses the quantitative and comparative evaluation of scientists, groups, institutions, and countries' contribution to the advancement of knowledge and proper guidance in which direction the research has to be conducted (Rousseau et al, 2018). Scientometrics is an indispensable method in the investigation carried out through publications and citations, or, stated alternatively, insofar as scientometric techniques are applied to scientific and technical literature. In this paper, an attempt is made to analyze the literature published on endocrinology during the period of 1992 to 2021.

## REVIEW OF LITERATURE

Many studies have carried out in different disciplines and also study the authorship pattern in scientometric studies on different subjects are reviewed here.

Rahul & Nishy (2016) have focused study on the mycobacterial tuberculosis and leprosy in India during the year of 1987 to 2012. Data was retrieved from the Web of Science database. Identifying the most productive Organizations, authors, and journals. authors also used different parameters such as Relative Activity Index, Activity Index, highly Co-authorship pattern, and highly cited papers.

Ram S (2017) reveals that breast cancer research in India, based on Scopus, MESH, and PubMed databases form the year of 1975 to 2014. The result shows that the Indian Journal of Cancer has the highest impact factor with (0.802) in the year

2014, and the USA has the highest collaborative research country with India (9.75%).

Nair & Raja (2018) observed that the Indian genetic Diversity research from the year 2013 to 2017 by using the Web of Science database. The study focuses on the wise growth rate & doubling time, most published journals, institution wise distribution, and country. the highest collaborative index value is 6.24 (2016) & the Collaborative Coefficient is the highest in the year 2016 (0.76), USA has the highest collaborated country with India in 160 publications.

Ram S (2018) divulge that Indian leishmaniasis research from the year of “1968 to 2017” in the Scopus, PubMed & Medical Subject Headings (MESH) databases. The study emphasized on the Banaras Hindu University, Varanasi has the highest number of citations i.e.15582, and the PLOS Neglected Tropical Diseases journal published from the USA has the highest Impact factor (3.834). The result shows the strength of the Indian research and shall be able to enhance the awareness among the stockholders in better policy decisions.

Ramakrishnan J et.al. (2019) detected the growth of Indian Lung cancer literature from the year of 2010 to 2015. Data was collected from the MEDLINE database. The authors used different indicators Relative growth rate, doubling time, year-wise growth of publication, country productivity, & Activity index. The result shows that Indian efforts in Lung Cancer research were better in three years out of six years of study.

The review of literature reveals that the previous studies focused on endocrinology and its allied

subjects research, and most of the data were retrieved from Pubmed, MEDLINE, MESH, and Web of Science databases. Furthermore, few studies have determined the Collaborative coefficient, relative growth rate, doubling time, and activity index. The present study is based on data accessed from the Web of Science citation database and comprehensively relates to the following indicators such as authorship pattern, collaborative index, and degree of collaboration. Hence this study would bridge the gap.

### **OBJECTIVES OF STUDY**

The major objectives of the study are as follows:

1. To study the growth of endocrinology from the year of 1992 to 2021;
2. To examine the most prolific authors in the field of endocrinology literature;
3. To analyze the sub-areas of endocrinology literature;
4. To determine the authorship pattern in the endocrinology literature;
5. To find out the single multi-authored papers and study the degree of collaboration;
6. To examine the collaborative index in the endocrinology literature;
7. To ascertain the most productive institutions/organizations;
8. To determine the most prolific journals;
9. To study the country wise collaborative sharing of publications; and

10. To find out the highly cited papers in endocrinology literature.

### **METHODOLOGY**

The present study is a scientometric analysis of the authorship patterns in the field of endocrinology for 30 years during the period of 1992 to 2021. The data was collected from the Web of Science ([www.isiknowledge.com](http://www.isiknowledge.com)) database maintained by Clarivate Analytics. The data on endocrinology was extracted by using the key word SU= Endocrinology AND CU=India on Endocrinology for the same period. For interpreting the data, MS-Excel and VOS Viewer software were used. The data obtained resulted as of June 2022, a total number of 9812 publications and 159424 citations were retrieved during the period of the study.

### **DATA ANALYSIS AND INTERPRETATION**

#### **Growth of Endocrinology Research Publications**

Table 1 indicates the year wise distribution of publications of Endocrinology research during the period of 1992 to 2021. A total number of 9812 publications were published in this field. The highest number of publications 797 (8.12%) were published in the year 2020 and the least number of publications were found in the year 1996 (0.65%). The average number of publications per year is 327.06. The gradual increase in the number of publications indicate the changing trends of research in endocrinology.

**Table 1: Year-wise distribution of Publication**

<b>Year</b>	<b>TP</b>	<b>Cumulative TP</b>	<b>%</b>	<b>Cumulative %</b>
1992	72	72	0.73	0.73
1993	79	151	0.81	1.54
1994	97	248	0.99	2.53
1995	82	330	0.84	3.36
1996	64	394	0.65	4.02
1997	193	587	1.97	5.98
1998	98	685	1.00	6.98
1999	112	797	1.14	8.12
2000	135	932	1.38	9.50
2001	116	1048	1.18	10.68
2002	148	1196	1.51	12.19
2003	177	1373	1.80	13.99
2004	162	1535	1.65	15.64
2005	157	1692	1.60	17.24
2006	218	1910	2.22	19.47
2007	228	2138	2.32	21.79
2008	248	2386	2.53	24.32
2009	486	2872	4.95	29.27
2010	470	3342	4.79	34.06
2011	415	3757	4.23	38.29
2012	441	4198	4.49	42.78
2013	569	4767	5.80	48.58
2014	533	5300	5.43	54.02
2015	529	5829	5.39	59.41
2016	562	6391	5.73	65.13
2017	619	7010	6.31	71.44
2018	575	7585	5.86	77.30
2019	691	8276	7.04	84.35
2020	797	9073	8.12	92.47
2021	739	9812	7.53	100
	<b>9812</b>		<b>100</b>	

**Highly Productive Authors in the field of Endocrinology Research**

Table 2 represents the highly productive authors in the field of endocrinology. The author Mohan, V of Dr. Mohan's Diabetes Specialities Centre, Chennai, Tamil Nadu ranks first with 359

publications with 10833 citations, (ACPP 30.31 and h-index 55), followed by Ramachandran, A of M. V. Hospital for Diabetes, Diabetes Research Centre, Chennai, Tamil Nadu has published 223 publications with 9343 citations (ACPP 41.9 and h-index 47), Bhansali, Anil of Post Graduate Institute of Medical Education &

Research, Chandigarh has 184 publications with 3326 citations (ACPP 18.08 and h-index 28).

### Highly Productive Authors in the field of Endocrinology Research

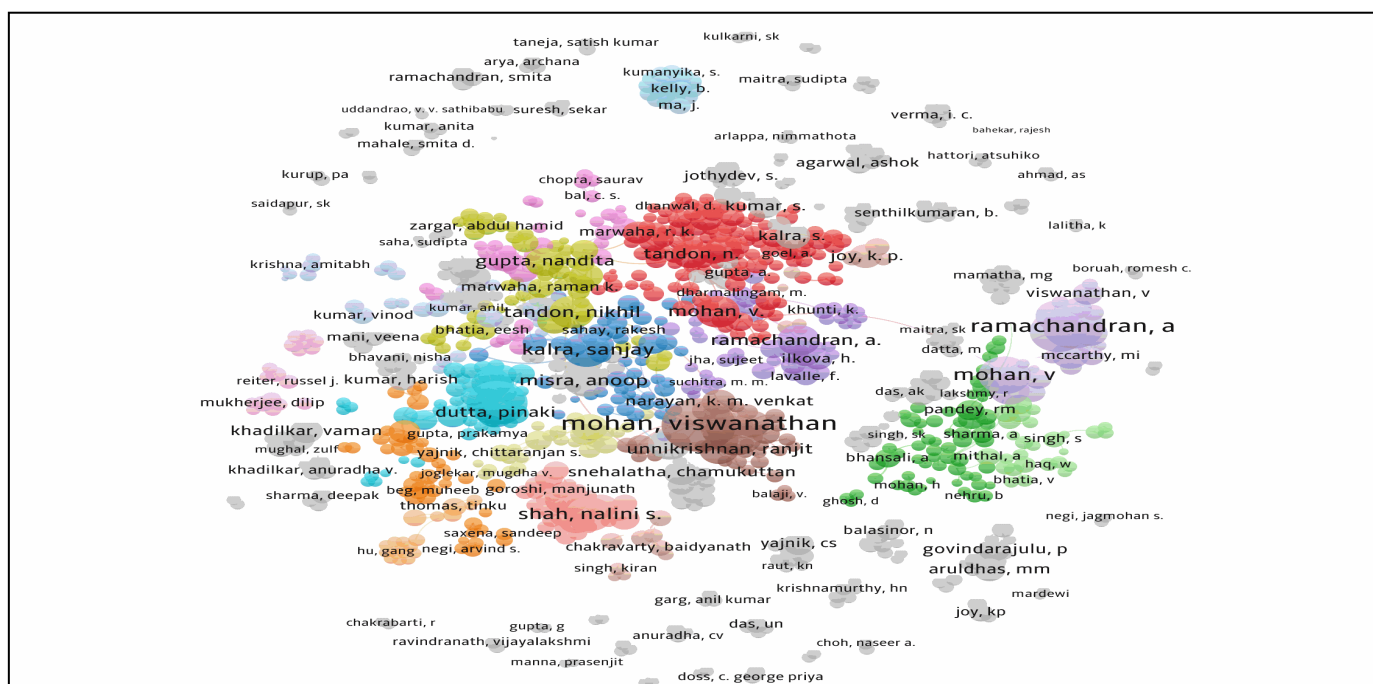
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**Table 2: Highly Productive Authors of Endocrinology Research in India**

Sr. No.	Author	Affiliation / Institution	TP	TC	ACP	H-Index
1	Mohan, V	Dr. Mohan's Diabetes Specialities Centre, Chennai, Tamil Nadu	359	10833	30.31	55
2	Ramachandran, A	M. V. Hospital for Diabetes, Diabetes Research Centre, Chennai, Tamil Nadu	223	9343	41.9	47
3	Bhansali, Anil	Post Graduate Institute of Medical Education & Research, Chandigarh	184	3326	18.08	28
4	Kumar, Ashutosh	Council Of Scientific and Industrial Research–Indian Institute of Toxicology Research (CSIR–IITR), Lucknow, Uttar Pradesh	161	4054	25.18	33
5	Kalra, Sanjay	Bharati Hospital & BRIDE, Karnal, Haryana	149	1548	10.39	20
6	Kumar, Sudhir	Council Of Scientific and Industrial Research -Central Drug Research Institute (CSIR-CDRI), Department of Endocrinology, Lucknow, Uttar Pradesh	143	1764	12.34	26
7	Tandon, Nikhil	All India Institute of Medical Sciences, New Delhi	137	2114	15.43	25
8	Snehalatha C	M. V. Hospital for Diabetes, Diabetes Research Centre, Chennai, Tamil Nadu	134	6718	50.13	37
9	Gupta, N	All India Institute of Medical Sciences, New Delhi	124	2596	20.94	29

10	Anjana, R. M	Madras Diabetes Research Foundation (MDRF), Chennai, Tamil Nādu	122	3048	24.98	27
11	Mithal, A	Indraprastha Apollo Hospitals, New Delhi	111	3990	35.95	23
12	Gupta, Sunita	Fortis C-Doc Hospital, New Delhi	110	980	8.91	18
13	Singh, Shantanu	Pramukhswami Medical College, Karamsad, Gujara	109	1472	13.5	22
14	Misra, Anoop	Fortis C-Doc Hospital, Department of Diabetes & Metabolism, Endocrinology, New Delhi	108	4487	41.55	33
15	Ghosh, Saurabh	Indian Statistical Institute, Human Genetics Unit, West Bengal, Kolkata	106	1519	14.33	2
16	Bhadada, Sanjay K	Postgraduate Institute of Medical Education & Research, Department Endocrinology, Chandigarh	99	1031	10.41	17
17	Kumar, V	Chaudhary Charan Singh University Meerut, Meerut, Uttar Pradesh	88	1080	12.27	21
18	Kumar, Rajesh	National Institute of Nutrition, Department of Immunology & Microbiology, Hyderabad	83	1488	17.93	20
19	Yajnik, C.S	M. Viswanathan Diabetes Research Centre, Chennai, Tamil Nadu	82	5304	64.68	32
20	Gupta, Atul	Central Institute of Medicinal and Aromatic Plants, Department of Medical Chemical, Kukrail, Lucknow, Uttar Pradesh	81	981	12.11	17



### Research output under various sub-fields of Endocrinology

Table 3 indicates research output sub fields in Indian endocrinology research during the period of 1992 to 2021. Biochemistry Molecular Biology contributed the highest research publications i.e. 1981 (34.36%), followed by

Nutrition Dietetics with 632 (10.96%) publications, and Zoology with 502 (8.71%) publications. Hence, most of the endocrinology applications are seen in Biochemistry Molecular Biology, Nutrition Dietetics, Zoology, Neurosciences Neurology, and Pediatrics. In the near future, endocrinology will exist as a separate discipline.

**Table 3: Distribution of publications in different Sub-fields**

Sl. No.	Subject Name	TP	%	Cumulative	Cumulative %
1	Biochemistry Molecular Biology	1981	34.36	1981	34.36
2	Nutrition Dietetics	632	10.96	2613	45.32
3	Zoology	502	8.71	3115	54.02
4	Neurosciences Neurology	419	7.27	3534	61.29
5	Pediatrics	400	6.94	3934	68.23
6	Cell Biology	258	4.47	4192	72.70
7	Physiology	196	3.40	4388	76.10
8	Pharmacology Pharmacy	180	3.12	4568	79.22
9	Research Experimental Medicine	175	3.04	4743	82.26
10	Toxicology	154	2.67	4897	84.93
11	Urology Nephrology	153	2.65	5050	87.58
12	Immunology	142	2.46	5192	90.05
13	Genetics Heredity	104	1.80	5296	91.85
14	Biophysics	102	1.77	5398	93.62
15	Reproductive Biology	99	1.72	5497	95.33
16	Obstetrics Gynecology	90	1.56	5587	96.90
17	Hematology	60	1.04	5647	97.94
18	Cardiovascular System Cardiology	53	0.92	5700	98.86
19	Science Technology Other Topics	34	0.59	5734	99.45
20	General Internal Medicine	32	0.55	5766	<b>100</b>
	<b>Total</b>	<b>5766</b>	<b>100</b>		

### Distribution of Authorship Pattern

Table 4 shows the authorship pattern of 9812 publications during the period of 1992 to 2021. The data is divided into eleven blocks as single., two, three, four five six, seven, eight, nine, ten, and more than ten authored publications. The result shows that three authored publications were ranked first with 1541

publications. The year-wise analysis shows that the performance of three authored publications is better in almost all the years except in 2020 and 2021. Followed by two authored papers which ranked second with 1443 publications of the total contributions. The year-wise analysis shows that the two authored contributions have shown a considerable trend in 2010 and 2020. The four



authored papers ranked third with 1425 of the total publication. The five authored papers ranked fourth with 1244 of the total publication. The six

authored papers ranked fifth with 980 of the total publication during the period of 1992 to 2021.

**Table 4: Distribution of Authorship Patternship**

Year	Single A	Two A	Three A	Four A	Five A	Six A	Seven A	Eight A	Nine A	Ten A	More than ten A	Total
1992	2	24	25	8	5	4	1	2	1	0	0	72
1993	3	30	15	16	8	1	2	1	0	1	2	79
1994	9	18	25	21	13	4	2	2	2	0	1	97
1995	5	24	14	17	9	4	5	0	3	1	0	82
1996	2	17	18	9	11	2	1	1	1	0	2	64
1997	10	40	41	34	30	18	3	4	3	2	8	193
1998	1	22	24	17	19	5	4	3	1	1	1	98
1999	2	27	28	20	19	7	2	3	1	0	3	112
2000	4	25	31	23	24	18	5	0	0	2	3	135
2001	2	26	24	19	17	11	9	2	1	1	4	116
2002	3	33	32	25	23	14	8	4	1	2	3	148
2003	4	31	41	33	19	15	10	14	7	1	2	177
2004	6	26	34	27	22	13	14	10	5	0	5	162
2005	3	18	25	29	35	18	10	10	4	2	3	157
2006	5	25	41	29	47	33	14	9	10	1	4	218
2007	10	37	46	40	30	21	18	7	7	2	10	228
2008	13	53	38	33	36	22	20	12	6	7	8	248
2009	48	94	83	64	56	42	34	21	22	10	12	486
2010	16	65	71	78	70	46	36	32	26	10	20	470
2011	24	64	63	65	51	48	31	15	16	7	31	415
2012	18	59	65	72	53	60	34	18	14	11	37	441
2013	35	75	80	88	70	65	40	39	16	22	39	569
2014	36	67	70	77	69	65	43	25	23	10	48	533
2015	32	65	68	70	59	65	41	32	21	15	61	529
2016	42	70	82	79	75	49	38	34	20	21	52	562
2017	48	89	76	78	70	68	45	35	21	18	71	619
2018	21	67	94	75	66	53	36	40	36	23	64	575
2019	32	98	93	93	67	58	48	49	46	27	80	691
2020	37	81	96	99	88	77	60	62	51	48	98	797
2021	35	73	98	87	83	74	55	56	48	44	86	739
<b>Total</b>	<b>508</b>	<b>1443</b>	<b>1541</b>	<b>1425</b>	<b>1244</b>	<b>980</b>	<b>669</b>	<b>542</b>	<b>413</b>	<b>289</b>	<b>758</b>	<b>9812</b>



**Degree of Collaboration**

Single Vs Multiple authors: The major finding of the study was that the Endocrinology domain is highly collaborative as the analysis of data resulted that multiple authorship of the paper is used to measure the extent of research collaboration. (Subramanyam, 1983) 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, the Formula is

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

Where:

DC= Degree of Collaboration

Nm = The number of multi authored papers,

Ns = The number of single-author paper

The year-wise distribution of the degree of collaboration is presented in Table 5. It shows that there is an increasing and decreasing trend in the degree of collaboration, i.e. 0.97 in 1992 to 0.95 in 2021. The average degree of collaboration is 0.96. The degree of collaboration is high in the year 1998 and the degree of collaboration is low in the year 2009, when single authorship productivity is 9.45% and multiple authorship productivity is 8.17%.

**Table 5: Single Vs Multi-Authored and Degree of collaboration (Annual Distribution of degree of Collaboration of Authorship)**

Year	Single Author (Ns)		Multi Author (Nm)		Total	Degree of Collaboration
	No. of Publication	%	No. of Publication	%		
1992	2	0.39	70	0.75	72	0.97
1993	3	0.59	76	0.82	79	0.96
1994	9	1.77	88	0.95	97	0.91
1995	5	0.98	77	0.83	82	0.94
1996	2	0.39	62	0.67	64	0.97
1997	10	1.97	183	1.97	193	0.95
1998	1	0.20	97	1.04	98	0.99
1999	2	0.39	110	1.18	112	0.98
2000	4	0.79	131	1.41	135	0.97
2001	2	0.39	114	1.23	116	0.98
2002	3	0.59	145	1.56	148	0.98
2003	4	0.79	173	1.86	177	0.98

2004	6	1.18	156	1.68	162	0.96
2005	3	0.59	154	1.66	157	0.98
2006	5	0.98	213	2.29	218	0.98
2007	10	1.97	218	2.34	228	0.96
2008	13	2.56	235	2.53	248	0.95
2009	48	9.45	438	4.71	486	0.90
2010	16	3.15	454	4.88	470	0.97
2011	24	4.72	391	4.20	415	0.94
2012	18	3.54	423	4.55	441	0.96
2013	35	6.89	534	5.74	569	0.94
2014	36	7.09	497	5.34	533	0.93
2015	32	6.30	497	5.34	529	0.94
2016	42	8.27	520	5.59	562	0.93
2017	48	9.45	571	6.14	619	0.92
2018	21	4.13	554	5.95	575	0.96
2019	32	6.30	659	7.08	691	0.95
2020	37	7.28	760	8.17	797	0.95
2021	35	6.89	704	7.57	739	0.95
	<b>508</b>	<b>100</b>	<b>9304</b>	<b>100</b>	<b>9812</b>	<b>0.95</b>

### Collaborative Index

The collaborative 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.

The Collaborative index has been calculated by using the formula given by Lawani (1980) as:

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

Where,

j = the number authors in an paper i.e. 1, 2, 3..

fj = the number of j authored papers published in discipline during a certain period of time

N = the total number of papers published in discipline during a certain period of time

A = the total number of authors per papers

Table 6 examined the Collaborative Index (CI) values, it can be obtained by the total number of authors divided by the total number of published papers. Collaborative Index during the period of

1992 to 2021 was calculated. The highest Collaborative Index value is 7.15 in the year 2021, followed by 7.10 in 2020. The least Collaborative Index value is 3.31 in the year 1992. The average collaborative Index value is 4.79. and the collaborative Index for universal value is 5.38. The result shows that the value of the collaborative Index gradually increased from the year of 1992 to 2021.

**Table 6: Collaborative Index**

<b>Year</b>	<b>TP</b>	<b>No. of Authors</b>	<b>Collaborative Index</b>
1992	72	238	3.31
1993	79	276	3.49
1994	97	354	3.65
1995	82	304	3.71
1996	64	243	3.80
1997	193	811	4.20
1998	98	394	4.02
1999	112	443	3.96
2000	135	561	4.16
2001	116	503	4.34
2002	148	620	4.19
2003	177	787	4.45
2004	162	744	4.59
2005	157	758	4.83
2006	218	1049	4.81
2007	228	1053	4.62
2008	248	1141	4.60
2009	486	2133	4.39
2010	470	2399	5.10
2011	415	2098	5.06
2012	441	2343	5.31
2013	569	2980	5.24
2014	533	2855	5.36
2015	529	3006	5.68
2016	562	3017	5.37
2017	619	3411	5.51

2018	575	3343	5.81
2019	691	4014	5.81
2020	797	5657	7.10
2021	739	5287	7.15
<b>Total</b>	<b>9812</b>	<b>52822</b>	<b>5.38</b>

### Highly Productive Institutions in the field of Endocrinology research

Table 7 Analyses the top 20 highly productive institutions based on the publications, citations, and Average citation per publication. According to the Web of Science database. All India Institute of Medical Sciences (AIIMS), New Delhi, has published the highest number of publications in the field of endocrinology, i.e. 720 publications, followed by Council of Scientific Industrial Research (CSIR), New Delhi has contributed 708 publications, Post Graduate Institute of Medical Education Research (PGIMER), Chandigarh, has contributed 410 publications, and Indian Council of Medical

Research (ICMR), New Delhi, has contributed 396 publications.

In terms of citations received per publications for total publications of these top 25 institutions. Madras Diabetes Research Foundation, Chennai, has received the highest citations i.e. 12042 with 36.6 average citations per paper (ACPP), followed by King Edward Memorial Hospital and Seth Gordhandas Sunderdas Medical College, Mumbai, with 4521 citations, and it's ACPP is 30.34, and Department of Science Technology (DST), New Delhi, received 3794 citations with 28.53 average citations per paper.

**Table 7: Highly Productive Institutions in the field of Endocrinology research**

Sl. No.	Institution / organization	TP	TC	ACP	H-index
1	All India Institute of Medical Sciences (AIIMS), New Delhi	720	11794	16.38	53
2	Council of Scientific Industrial Research (CSIR), New Delhi	708	17152	24.23	61
3	Post Graduate Institute of Medical Education Research (PGIMER), Chandigarh	410	6182	15.08	36
4	Indian Council of Medical Research (ICMR), New Delhi	396	7359	18.58	43
5	Madras Diabetes Research Foundation, Chennai	329	12042	36.6	54
6	Banaras Hindu University (BHU), Varanasi	266	3541	13.31	30
7	CSIR Central Drug Research Institute (CDRI) Lucknow, Uttar Pradesh	235	3594	16.83	35
8	Sanjay Gandhi Postgraduate Institute of Medical Sciences, )Lucknow, Uttar Pradesh	206	3510	17.04	28
9	Indian Council of Agricultural Research (ICAR) New Delhi	205	3505	17.1	30

10	University of Delhi, Delhi	190	2044	10.76	24
11	Panjab University, Chandigarh	189	3033	16.05	32
12	Department of Biotechnology (DBT), New Delhi	180	4012	22.29	38
13	ICMR National Institute of Nutrition (NIN), Hyderabad, Telangana	175	2333	13.33	26
14	University of Madras, Chennai, Tamil Nadu	166	2894	17.33	29
15	Manipal Academy of Higher Education (MAHE), Manipal, Karnataka	158	2294	14.52	22
16	King Edward Memorial Hospital and Seth Gordhandas Sunderdas Medical College, Mumbai	149	4521	30.34	30
17	Institute of Post Graduate Medical Education Research (IPGMER), Kolkata	146	1828	12.52	22
18	Defence Research Development Organisation (DRDO), New Delhi	144	2441	16.95	25
19	Indian Institute of Science (IISc), Bangalore	141	2377	16.86	28
20	ICMR National Institute for Research in Reproductive Health (NIRRH), Mumbai	140	2457	17.55	28

### Most Preferred Journals in Endocrinology research

Table 8 identifies the most preferred journals (top 20) in the field of endocrinology. Based on average citations per paper (ACPP), The Diabetes Care from the USA has received the highest (i.e.97.16) average citation per paper,

followed by Journal of Clinical Endocrinology Metabolism from the USA (40.29), Journal of Trace Elements in Medicine and Biology from Netherlands (25.9), Comparative Biochemistry and Physiology C Toxicology Pharmacology from Netherlands (23.61), Diabetes Research and Clinical Practice from Netherlands (23.2), and Diabetic Medicine from USA (23.11).

**Table 8: Most Preferred Journals in Endocrinology research**

Sl. No.	Journal	TP	TC	ACP	Country	Impact Factor
1	Annals of Nutrition and Metabolism	495	1217	2.46	Switzerland	2.528
2	Biological Trace Element Research	484	7559	15.62	Germany	2.43
3	International Journal of Diabetes in Developing Countries	466	2067	4.44	Germany	0.495
4	Osteoporosis International	459	3251	7.08	Germany	3.591
5	Diabetologia	456	7182	15.75	Germany	7.113
6	Free Radical Biology and Medicine	428	9838	22.99	Netherlands	7.376
7	Diabetes Research and Clinical Practice	382	8864	23.2	Netherlands	5.602



**International collaboration among research institutions in India**

Table 9 identifies the international collaboration of India with the 20 countries during the period of 1991 to 2021 in the field of Endocrinology. India has the highest collaboration with the USA with 1297 publications and 43387 citations, (33.45 ACPP and H-index 91), followed by second

highest collaboration with England amounting to 588 publications with 25460 citations (43.3 ACPP and H-index 76), Australia ranked third with 301 publications and 18994 citations (63.1 ACPP and H-index 60), Canada with 284 publications and Peoples R China with 239 publications ranked fourth and fifth respectively followed by other countries, as shown in table 9.

**Table 9: International collaboration among research institution in India**

Sl. No.	Country	TP	TC	ACP	H-index
1	USA	1297	43387	33.45	91
2	England	588	25460	43.3	76
3	Australia	301	18994	63.1	60
4	Canada	284	14014	49.35	56
5	Peoples R China	239	16799	70.29	55
6	Germany	229	12852	56.12	47
7	Italy	214	14156	66.15	45
8	France	196	6701	34.19	39
9	Denmark	193	13552	70.22	42
10	Japan	190	13410	70.58	42
11	Switzerland	161	7765	48.23	41
12	Sweden	157	8616	54.88	36
13	Brazil	152	10588	69.66	45
14	Spain	130	7628	58.68	36
15	Netherlands	125	9513	76.1	37
16	Saudi Arabia	123	2199	17.88	23
17	Argentina	122	3767	30.88	31
18	South Africa	122	6018	49.33	38
19	Turkey	118	2591	21.96	26
20	South Korea	117	5780	49.4	28

**Highly Cited Papers in the field of Endocrinology research**

Table 10 reveals the highly cited papers from India in the field of endocrinology during the period of 1992 to 2021. There were 10 highly

cited papers on endocrinology which have received more than 1000 citations. These 10 papers received 11815 citations. The paper title on International Association of Diabetes and Pregnancy Study Groups Recommendations on the Diagnosis and Classification of



Hyperglycemia in Pregnancy received the highest citations i.e.3034, published in *Diabetes Care* in the year 2010, followed by Global Prevalence and Major Risk Factors of Diabetic Retinopathy received second highest citations i.e. 2352, published in the journal *Diabetes Care* during the year 2006, The Indian Diabetes Prevention

Programme shows that lifestyle modification and metformin prevent type 2 diabetes in Asian Indian subjects with impaired glucose tolerance (IDPP-1) received citations i.e. 1158, published in the journal *Diabetologia*, in the year 2006. This indicates that more research is being carried out on newly developing areas.

**Table 10: Highly Cited Papers in the field of Endocrinology research**

Sr. No.	Citations	Year	Title	Authors	Vol & Issue No.	Journal Name	Page No.
1	3034	2010	International Association of Diabetes and Pregnancy Study Groups Recommendations on the Diagnosis and Classification of Hyperglycemia in Pregnancy	Metzger, BE; Gabbe, SG; Yasuhi, I	33(3)	Diabetes Care	676-689
2	2352	2012	Global Prevalence and Major Risk Factors of Diabetic Retinopathy	Yau, JWY; Rogers, SL; Wong, TY	35(3)	Diabetes Care	556-564
3	1158	2006	The Indian Diabetes Prevention Programme shows that lifestyle modification and metformin prevent type 2 diabetes in Asian Indian subjects with impaired glucose tolerance (IDPP-1)	Ramachandran, A; Snehalatha, C; Vijay, V	49(2)	Diabetologia	289-297
4	1012	2009	Global vitamin D status and determinants of hypovitaminosis D	Mithal, A; Wahl, DA; Morales-Torres, J	20(11)	Osteoporosis International	1807 - 1820
5	892	2019	Clinical Targets for Continuous Glucose Monitoring Data Interpretation: Recommendations From the International Consensus on Time in Range	Battelino, T; Danne, T; Phillip, M	42(8)	Diabetes Care	1593 - 1603
6	830	2009	Efficacy and Safety Comparison of Liraglutide, Glimepiride, and Placebo, All in Combination With Metformin, in Type 2 Diabetes The LEAD (Liraglutide Effect and Action in Diabetes)-2	Nauck, M; Frid, A; Matthews, DR	32(1)	Diabetes Care	84-90

7	762	2017	International Consensus on Use of Continuous Glucose Monitoring	Danne, T; Nimri, R; (...); Phillip, M	40(12)	Diabetes Care	1631 - 1640
8	645	2008	Obesity and the Metabolic Syndrome in Developing Countries	Misra, A and Khurana, L	93(11)	Journal of Clinical Endocrinology & Metabolism	S9-S30
9	608	2009	Liraglutide vs insulin glargine and placebo in combination with metformin and sulfonylurea therapy in type 2 diabetes mellitus (LEAD-5 met+SU): a randomised controlled trial	Russell-Jones, D; Vaag, A; Simo, R	52(10)	Diabetologia	2046 - 2055
10	522	2001	High prevalence of diabetes and impaired glucose tolerance in India: National Urban Diabetes Survey	Ramachandran, A; Snehalatha, C; Nair, JD	44(9)	Diabetologia	1094 - 1101

## MAJOR FINDINGS OF THE STUDY

The following important findings are:

- i. The highest number of research publications were found in the year 2020 i.e., 797 and lowest number of publications in the year 1996 with 64 publications respectively.
- ii. It is identified that Biochemistry and Molecular Biology has highest number of publications (1981) produced on endocrinology.
- iii. It is observed from the study that out of top 20 authors, Mohan, V has ranked first with contribution of 359 publications with 10833 citations and lowest number of publications was contributed by Gupta, Atul i.e. 81 publications with 981 citations.
- iv. It is found that the majority of the contributions were three authored publications i.e., 1541 and least number of contributions were ten authored with 289 publications.
- v. It is identified that the All-India Institute of Medical Sciences (AIIMS), New Delhi, has contributed the highest number of publications i.e., 720, followed by Council of Industrial Research (CSIR), New Delhi, has contributed 708 publications.
- vi. It is noticed from the study that Annals of Nutrition and Metabolism from Switzerland has contributed the highest number of publications i.e., 495, followed by Biological Trace Element Research from Germany which has contributed 484 publications.
- vii. It is identified that USA has highest collaborated country with India i.e., 1297,

publications followed by England has contributed 588 publications.

- viii. It is found that “International Association of Diabetes and Pregnancy Study Groups Recommendations on the Diagnosis and Classification of Hyperglycemia in Pregnancy” is a highly cited paper with 3034 citations.

## CONCLUSION

In this study, an attempt is made to find out the authorship pattern in endocrinology in India during the period of 1992 to 2021 as reflected as the Web of Science (WOS) database. Endocrinology is one of the most important discipline in the field of medicine, yet the research in endocrinology is gradually increasing and there is an upward trend in India however, there is some fluctuation in trends of publications. India has the most worldwide publication share among the highest twenty most efficient countries in the field of endocrinology Nevertheless, there is scope for improvements and India can contribute much more looking at the potential that India possesses in endocrinology research. Indian medical and science research funding agencies including the Government should provide sufficient funding and other infrastructure facilities endocrinology. This study is an attempt to ascertain and forecast the trends of Indian research in endocrinology and its allied fields.

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