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Scientometric Analysis Of Autism Research Output During 2003-2022

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The present study is focussed on Indian contribution to autism research indexed in Scopus database during 2003 -2022.United States is the most predominant country with 30206 (31.96%). The United Kingdom appeared in the second rank with 9828 (10.39%) publications. Canada has occupied the third position with 4752 (5.02%) communications. It is noted that India occupies ninth place with 2096 (2.21%) publications out of the top twenty-five countries in the Autism research domain.The growth rate shows that the number of records in 2003 is 7 only and in 2022, it is 433 and the growth rate shows a fluctuating trend during the study period. The relative growth rate and doubling time is also fluctuating during the study period. Activity Index assess the research effort of a country in a specific field for a specific time. AI shows fluctuating for the study period.

Index Terms - Scientometric Analysis, Autism Research, Relative Growth Rate (RGR),Doubling Time (DT), Activity Index(AI)

I. INTRODUCTION

1.1 Autism

Autism is a neurodevelopmental problem distinguished by three main symptoms: poor communication, repeated confined patterns of conduct or passions. Early childhood is when symptoms first appear, frequently before the age of three, and they affect functioning. When autism was initially detected in the 1940s, only the most severely affected individuals were recognized, leading to the initial belief that it was a rather uncommon condition.(Blenner et al., 2011)

Autism is a neurodevelopmental condition that is typified by stereotyped behaviors, oral communication difficulties, and social deficiencies. Based on studies conducted on individuals with autism, researchers have determined that autism, is caused by a combination of environmental circumstances and inheritance.(Stavridou et al., 2021)

Autism has changed to a type of mental illness to a cognitive condition.(Botha et al., 2022).According to a study by Arora et al. (2018), the prevalence of neurodevelopmental disorders in children between the ages of 2 and 6 & 6 and 9 years in India is estimated to be 9.2% and 13.6%, respectively. Because of the enormous number of children and the lack of access to healthcare that disadvantaged people experience in a nation like India, neurodevelopmental disorders can pose a serious threat to healthy social development. Protecting the rights of children with disabilities and ensuring their growth in a pleasant and supportive environment requires changes in law, policy, attitudes, and society.

Despite being the second most populated country in the world, India's health care system is blatantly unfit to serve its people's demands.At every stage of health care and policy, there is a large deal of unmet

demand in India when it comes to the evaluation and treatment of Autism. It needs political will, vision, and urgency. will to treat autism similarly to starvation and infectious diseases, focusing on the establishment of early detection, diagnostic, and treatment procedures for Autism. (Mahajan & Sagar, 2023).

1.2 Scientometrics

Scientometrics can be defined as the "quantitative study of science, communication in science, and science policy" (Hess, 1997) Gaining understanding for the advancement of scientific research on a particular subject, a more general area of study, or even the corpus of scientific knowledge as a whole is the overarching goal of scientometrics research. Within the scientometrics study domain, scientometric mapping is a subdomain that denotes the use of quantitative techniques to comprehend and graphically portray specific metrics related to using bibliographic data-based scientific publications. In recent years, scientometric mapping has gained popularity as a means of assessing research topics due to advancements in data science and visualization tools. (Li et al., 2021).

1. REVIEW OF LITERATURE

Gupta et al., (2017)[1]studied 446 Indian papers on Autism research that were covered by the Scopus database between 2007 and 2016, with an average yearly growth rate of 23.86% and a citation impact of 9.02. India's contribution to world output climbed from 0.86% in 2007–11 to 1.57% in 2007–16, totalling 1.31% in 2012–16. India's share of worldwide collaborative publications on autism research climbed from 18.52% in 2007–11 to 27.81% in 2012–16, with a total of 25.56% from 2007–16. Of all the subjects studied in India between 2007 and 2016, Medicine contributed the most (64.75%), followed by the Neurosciences (21.97%), Computer Science (9.42%), Biochemistry, Genetics &Molecular Biology (19.96%), Psychology (9.64%), Pharmacology and Toxicology (7.17%).The top ten productive Indian authors and organizations collectively made contributions of 46.61% and 16.29% citation share, and 34.08% and 27.35% publication share.

Ravi and Jeyshankar(2019)[2] attempted a Scientometric analysis of Indian publications on the output of polio research. The study's time frame was restricted to 1994–2018 with data collected from Web of Science. The data analysis was done using Histcite software. The investigation found that, 488 records on polio research were published in India between 1994 and 2018 in Web of Science. The 488 records were all published in journals and were in English language. The greatest number of Indian publications (44) have been released in 2017. Articles make up two thirds of Indian polio research papers. 111 records (22.75%) had 1–10 cited references, 107 records (21.93%) had 11–20 cited references, and 98 records had 21–30 cited references.

A study on the quantitative analysis of research production on anemia sickness by VellaichamyandJeyshankar(2014)[3] was conducted by collecting data from Scopus database for 1993-2013. The study showed that 2013 had the fewest citations (0.56%) obtained. The survey also looked at subject patterns, authorship patterns, levels of collaboration, most productive authors, key Indian collaborative partners, highly cited publications, active institutions, and most productive periodicals.

2. OBJECTIVES

- To find out country wise productivity of Autism research in World during 2003-2022.
- To find out year wise productivity of Autism research in India during 2003-2022.
- To resolve Relative Growth Rate(RGR) and Doubling Time(DT) of Indian autism research publications
- To analyse the most productive journals in autism research in India
- To examine the most productive authors in Indian autism research publications during 2003-2022.
- To find out the Activity Index of Indian Autism Research Publications

3. METHODOLOGY

The data for the present study was collected from Scopus database for a period of 20 years from 2003-2022. The search with "autism" extracted 2096 records for the publications in India for autism research and analysed using excel. The following Scientometric techniques such as relative growth rate, doubling time, authorship pattern.

4. INTERPRETATION AND ANALYSIS

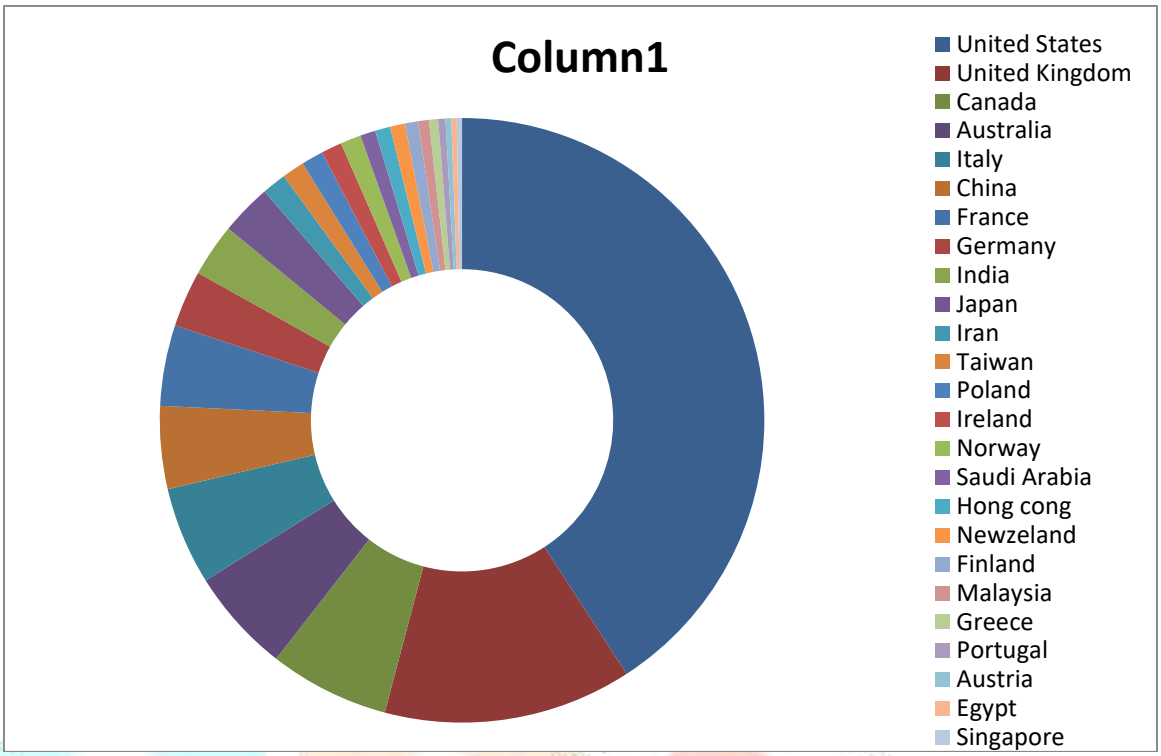
5.1 Country wise productivity of Autism research

Table 5.1 shows the productivity of top 25most producing countriesin the field of autism research publications during 2003-2022. United States is the most predominant country with 30206 (31.96%). The United Kingdom appeared in the second rank with 9828 (10.39%) publications. Canada has occupied the third position with 4752 (5.02%) communications. Australia has appeared as the fourth rank with 4122 (4.36%) publications. Italy has appeared at the fifth place with 3867 (4.09%) articles.It is stressed thatIndia occupies ninth place with 2096 (2.21%) publications out of the top twenty five countries in the Autism research domain.It is graphically represented in Figure 5.1.

Table 5.1 Country wise productivity of Autism research publications

S.No.	Country	No. ofarticles	Percentage	Cumulative	Cumulative percentage
1	UnitedStates	30206	31.96	30206	31.96
2	UnitedKingdom	9828	10.39	40034	42.36
3	Canada	4752	5.02	44786	47.39
4	Australia	4122	4.36	48908	51.75
5	Italy	3867	4.09	52775	55.84
6	China	3272	3.46	56047	59.30
7	France	3196	3.38	59243	62.68
8	Germany	2233	2.36	61476	65.05
9	India	2096	2.21	63572	67.27
10	Japan	2019	2.13	65591	69.40
11	Iran	958	1.01	66549	70.42
12	Taiwan	888	0.93	67437	71.36
13	Poland	865	0.91	68302	72.27
14	Ireland	823	0.87	69125	73.14
15	Norway	812	0.85	69937	74.01
16	SaudiArabia	606	0.64	70543	74.64
17	Hongcong	600	0.63	71143	75.28
18	Newzeland	588	0.62	71731	75.90
19	Finland	523	0.55	72254	76.45
20	Malaysia	428	0.45	72682	76.91
21	Greece	358	0.37	73040	77.28
22	Portugal	288	0.30	73328	77.59
23	Austria	228	0.24	73556	77.83
24	Egypt	212	0.22	73768	78.05
25	Singapore	208	0.22	73976	78.27

Figure 5.1 Country wise productivity of Autism research publications



5.2 Year wise Productivity of Autism Research Publications in India

The below Table 5.2 shows the productivity of India in the field of Autism Research publications during the study period of 2003-2022. India produced a total of 2096 records only during the study period of 2003-2022. The productivity shows fluctuating in position. Initially it is decreasing and then increasing. The lowest number of production in Autism Research is in 2003 with 7 documents only. The highest number of production in autism research in India is in 2022 with 433. Table shows a steady increase in the production of publications in the area of Autism research during the study period. India produced 0.33% of the total production of autism research publications in 2003. In 2022, 79.34% was produced. Figure No.5.2shows the graphical representation of productivity of India in the area of autism research publications from 2003-2022. It shows a gradual increase in the production of publications in the field of Autism research during 2003-2022.

Table 5.2 Year wise Productivity of India in Autism Research Publications

Year	No.of publications	Percentage	Cumulative Pub.	Cumulative Percentage
2003	7	0.33	7	0.33
2004	6	0.29	13	0.62
2005	12	0.57	25	1.19
2006	8	0.38	33	1.57
2007	12	0.57	45	2.15
2008	19	0.91	64	3.05
2009	24	1.15	88	4.20
2010	31	1.48	119	5.68
2011	29	1.38	148	7.06
2012	48	2.29	196	9.35
2013	63	3.01	259	12.36
2014	79	3.77	338	16.13

2015	101	4.82	439	20.94
2016	111	5.30	550	26.24
2017	118	5.63	668	31.87
2018	126	6.01	794	37.88
2019	254	12.12	1048	50
2020	287	13.70	1335	63.69
2021	328	15.65	1663	79.34
2022	433	20.66	2096	100
Total	2096			

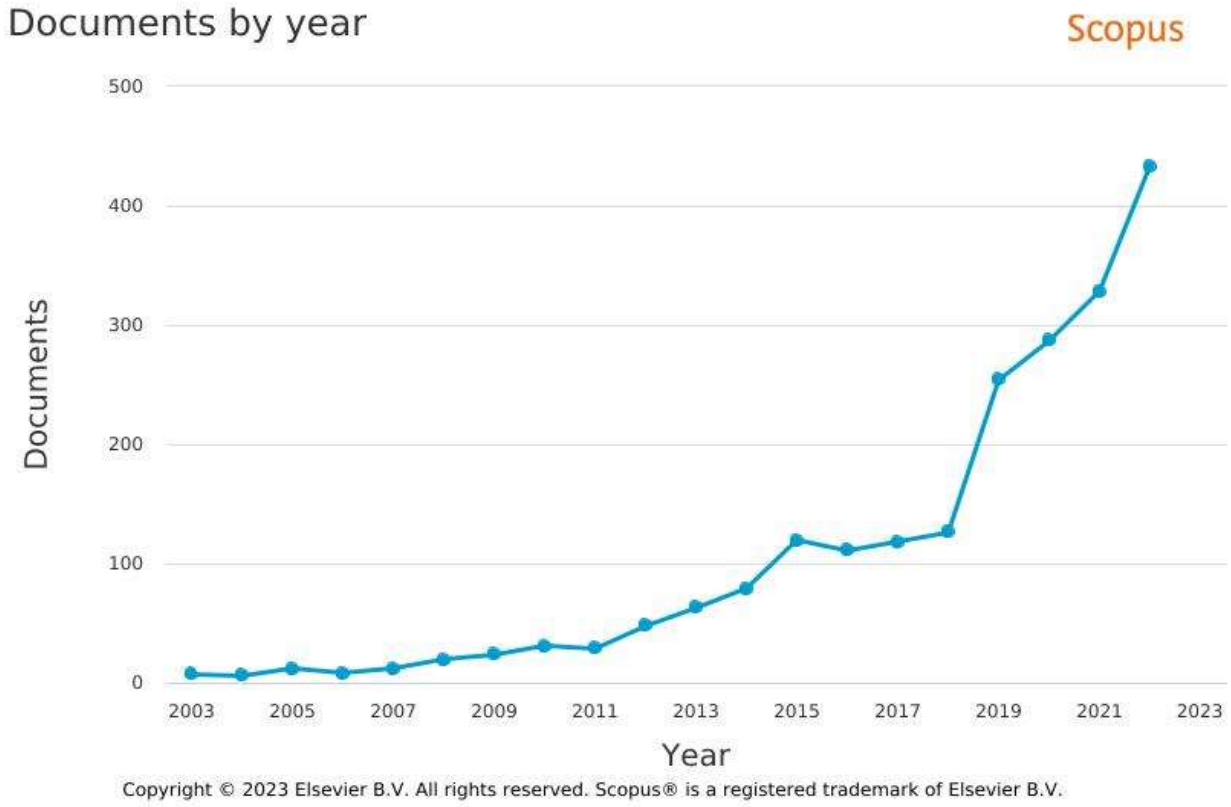


Figure 5.2Year wise productivity of India

4.3 Relative Growth Rate and Doubling Time

The table 5.3 reveals thatthe rate of growth of autism research literature is calculated by using Relative Growth rates (RGR) and Doubling time (DT) for the publications during the period of study. Table 5.3 presents the RGR and DT time of total research output on autism research. The RGR value for the year 2003 is 1.95 and the value for the final year 2022 is 0.28.The result shows that the value was not in standard position; it has been fluctuating from 2003 to 2022. The Doubling Time (DT) value for the year 2003 is 0.36 and the value for the final year 2022 is 2.48. It is explored that the doubling time value also been dilemma values during the period of study in autism research domain.

Table 5.3 Relative Growth rate and Doubling time

Year	N. of Pub.	Cumulative	W1	W2	RGR	DT
2003	7	7	--	1.95	1.95	0.36
2004	6	13	1.95	1.79	-0.16	-4.33
2005	12	25	1.79	2.48	0.69	1.00
2006	8	33	2.48	2.08	-0.40	-1.73
2007	12	45	2.08	2.48	0.40	1.73
2008	19	64	2.48	2.94	0.46	1.51
2009	24	88	2.94	3.18	0.24	2.89
2010	31	119	3.18	3.43	0.25	2.77
2011	29	148	3.43	3.37	-0.06	-11.55
2012	48	196	3.37	3.87	0.50	1.39
2013	63	259	3.87	4.14	0.27	2.57
2014	79	338	4.14	4.37	0.23	3.01
2015	101	439	4.37	4.62	0.25	2.77
2016	111	550	4.62	4.71	0.09	7.70
2017	118	668	4.71	4.77	0.06	11.55
2018	126	794	4.77	4.84	0.07	9.90
2019	254	1048	4.84	5.54	0.70	0.99
2020	287	1335	5.54	5.66	0.12	5.77
2021	328	1663	5.66	5.79	0.13	5.33
2022	433	2096	5.79	6.07	0.28	2.48
Total	2096					

4.4 Top 25 most Prolific Indian journals in Autism Research Publications

Table No. 5.4 shows the most prolific Indian journal wise research distributions in Autism research during the period from 2003 to 2022. It is observed that Indian Journal of Paediatrics has produced 80 articles with more predominant place, followed by Indian Journal of Psychiatrywhich published 46 communications with second rank. Asian Journal of Psychiatry is being produced 45 research output with third place. Journal of Indian Association for Child and Adolescent Mental Health has been published 42 contributions with fourth place. Indian Paediatrics has produced 40 research papers in Autism research. Both the Journal of Paediatric Neurosciences and Journal of Neurosciences in Rural Practice are published 9 articles with least places out of top 25 Indian journals in Autism research.

Top 25 Indian journals productivity in Autism research publications is depicted graphically in Figure No.5.3

Table 5.4Top 25 Indian journals in Autism Research Publications

Sl. No.	Name of the Journal	No. of Output
1	Indian Journal of Paediatrics	80
2	Indian Journal of Psychiatry	46
3	Asian Journal of Psychiatry	45
4	Journal of Indian Association for Child and Adolescent Mental Health	42
5	Indian Paediatrics	40
6	Indian Journal of Psychological Medicine	26
7	Journal of Autism and Developmental Disorders	24
8	Autism Research	19
9	Journal of Clinical and Diagnostic Research	16
10	International Journal of Recent Technology and Engineering	16
11	Lecture Notes in Electrical Engineering	15
12	Annals of Indian Academy of Neurology	15
13	Advances in Intelligent Systems and Computing	15
14	Journal of Clinical Psychiatry	14
15	Neurology India	12
16	Lecture Notes in Computer Science including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics	12
17	Plos One	11
18	Journal of Advanced Research in Dynamical and Control Systems	11
19	Advances in Neurobiology	11
20	Scientific Reports	10
21	Lecture Notes in Networks And Systems	10
22	Autism	10
23	Journal of Pediatric Neurosciences	9
24	Journal of Neurosciences In Rural Practice	9
25	Autism	9

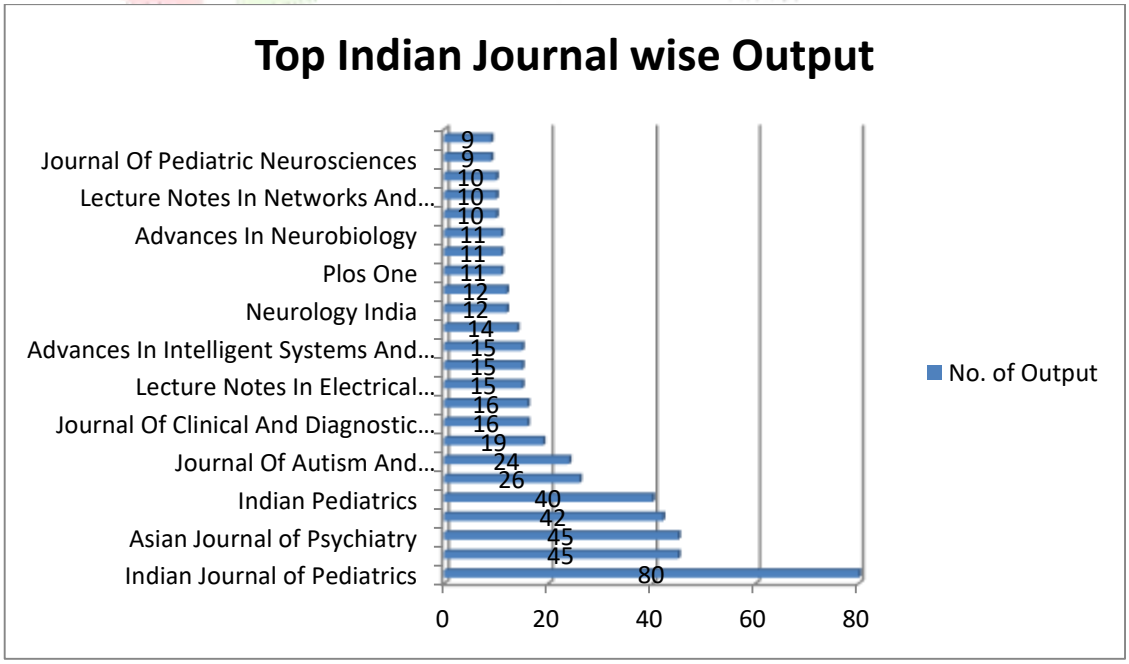


Figure 5.3 Top 25 Indian Journal wise Research Output in Autism

5.5 Top 25 Most Productive Indian Authors in Autism Research Publications

The table 5.5 analyses that the most productive Indian author is Lahiri, U, Indian Institute of Technology Gandhinagar, Indiawith 30 records (Citation is 1044, h-index is 16) dealing with Autism research as first position. Russell, P.S.S., Christian Medical College, Vellore, India published 24 research articles (Citation is 1242, h-index is 18) has appeared in the second rank. Malhi, P., Postgraduate Institute of Medical Education & Research, Chandigarh, India has produced 23 (Citation is1474, h-index is 20) records in the area of autism research with third place. Sinha, S., Manovikas Kendra, Kolkata, India contributed 22 (Citation is 866, h-index is 17) research papers with fourth rank. Singhi, P., Amrita Institute of Medical Sciences India, Kochi, India has published 21 (Citation is 4718, h-index is 35) articles in autism research with fifth place out of top twenty five authors in worldwide during the study period in Autism research publications. Table presents all the top 25 most producing Indian authors with their affiliation, citations and h index. Figure No.5.4 graphically presents the top 25 Indian authors in Autism research publications during 2003-2022.

Table No. 5.5 Indian Author wise Productivity in Autism Research (Top 25)

Sl. No.	Author	Affiliation	Records	citations	h-index
1	Lahiri, U.	Indian Institute of Technology Gandhinagar, Gandhinagar, India	30	1044	16
2	Russell, P.S.S.	Christian Medical College, Vellore, Vellore, India	24	1242	18
3	Malhi, P.	Postgraduate Institute of Medical Education & Research, Chandigarh, Chandigarh, India	23	1474	20
4	Sinha, S.	Manovikas Kendra, Kolkata, India	22	866	17
5	Singhi, P.	Amrita Institute of Medical Sciences India, Kochi, India	21	4718	35
6	Nair, M.K.C.	NIMS Medicity, Thiruvananthapuram, India	21	782	15
7	Patel, V.	Harvard Medical School, Boston, United States	20	53744	108
8	Gulati, S.	All India Institute of Medical Sciences, New Delhi	20	3887	30
9	Andrade, C.	National Institute of Mental Health and Neuro Sciences, Bengaluru, India	20	5817	36
10	Juneja, M.	Maulana Azad Medical College, New Delhi, India	18	933	14
11	Divan, G.	Sangath, Bardez, India	17	2625	13
12	Srinath, S.	National Institute of Mental Health and Neuro Sciences, Bengaluru, India	16	2942	24
13	Sharma, B.	Bharat Institute of Technology, Meerut, Meerut, India	15	209	6
14	Mehan, S.	I.S.F. College of Pharmacy, Moga, India	15	939	17
15	Chattarji, S.	Edinburgh Medical School, Edinburgh, United Kingdom	15	4170	25
16	Belmonte, M.K.	Nottingham Trent University, Nottingham, United Kingdom	15	4210	21
17	Saini, L.	All India Institute of Medical Sciences, Jodhpur, Jodhpur, India	13	500	9
18	Kakkar, D.	Dr. B.R. Ambedkar National Institute of Technology, Jalandhar, India	13	294	9

19	Ghosh, S.	University of Calcutta, Kolkata, India	13	432	11
20	George, B.	Child Development Center, Thiruvananthapuram, India	13	512	11
21	Singhal, N.	The National Centre for Autism, New Delhi, India	12	402	10
22	Madaan, P.	Amrita Institute of Medical Sciences India, Kochi, India	12	674	10
23	Sahu, J.K.	Postgraduate Institute of Medical Education & Research, Chandigarh, Chandigarh, India	11	999	18
24	Medhi, B	Postgraduate Institute of Medical Education & Research, Chandigarh, Chandigarh, India	11	3892	32
25	Sagar, R	All india Institute of Medical Sciences, new Delhi , India	10	350	67

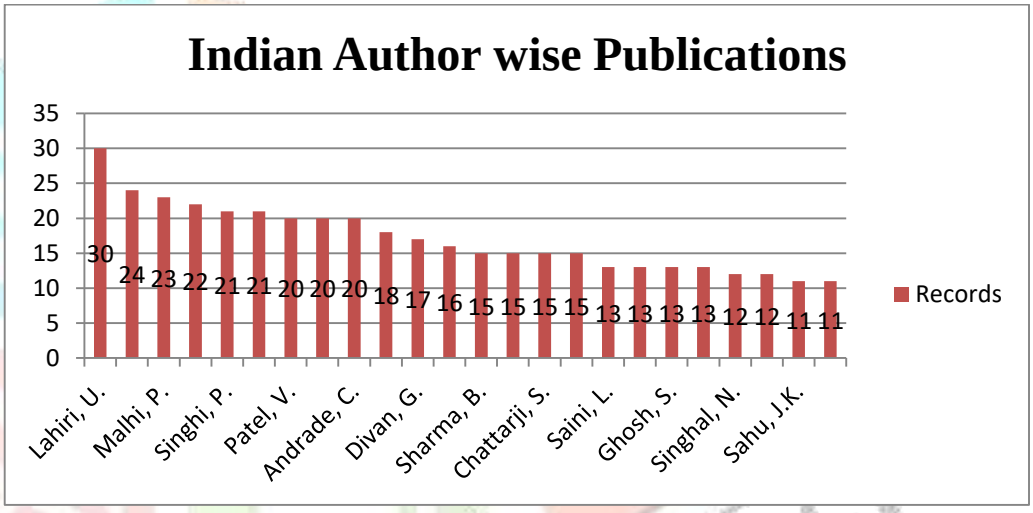


Figure 5.4Indian Author wise Publications

4.5 Activity Index

Activity Index of India is calculated and shown in Table No.5.6. AI is calculated for different years to see how India‘s research activity replaced during different years. Total AI for India in Autism research publications is 1446.46. AI for 2003 is 29.09, 2004 ,21.02 and for 2005 AI is 35.27 . AI for India in 2022 is 187.30. Activity Index assesses the research effort of a country in a specific field for a specific time. AI shows fluctuating for the study period.

Table 5.6 Activity Index of India in Autism Research Publications

Year	World Publications	India	AI
2003	1085	7	29.09
2004	1287	6	21.02
2005	1534	12	35.27
2006	1698	8	21.24
2007	2078	12	26.04
2008	2466	19	34.74
2009	2705	24	40.00

2010	3202	31	43.65
2011	3618	29	36.14
2012	4218	48	51.31
2013	4852	63	58.54
2014	5209	79	68.38
2015	5643	101	80.70
2016	6011	111	83.26
2017	6263	118	84.95
2018	6634	126	85.63
2019	7576	254	151.16
2020	8424	287	153.61
2021	9576	328	154.43
2022	10423	433	187.30
Total	94502	2096	1446.46

6 .CONCLUSION

The present study emphasis on contribution of Autism research publications by India only. The study shows that India produces only low quantity of publications in the field of autism research. It is essential to build the field's infrastructure for coordinating, advancing, and enhancing the efficacy of autism research as well as enhancing autism surveillance. Take initiatives to make it possible to measure the prevalence of autism in Indian people more accurately. India has to give more attention to the area of autism research in order to improve the quality of research in autism and to take effort to restrict the prevalence of autism in India. The study show that the production of literature in 2003 is only 7 and 2022 is 433. The growth rate is fluctuating and not in a standard position.It is observed that Indian Journal of Paediatrics has produced 80 articles with more predominant place followed by Indian Journal of Psychiatry which published 46 communications with second rank.The most productive Indian author is Lahiri, U, Indian Institute of Technology Gandhinagar, Indiawith 30 records (Citation is 1044, h-index is 16) dealing with Autism research as first position.Activity Index assesses the research effort of a country in a specific field for a specific time. Activity Index is very high (187.30) in 2022.

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