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Growth of Indian Research Output on Brain Tumour: A Bibliometric Study Using Scopus Database

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Abstract:

Growth of Scientific research were measured using bibliometric study on a discipline or a domain. Indian research on brain tumour has been measured using the bibliometric study. A total of 1,47,641 publications can be seen in Scopus, multi discipline data base on "Brain Tumour" during the forty years period of 1974-2013. Nearly 2,880 scientific articles (1.95%) were published on brain tumour. The techniques such year wise distribution, authorship pattern, source title, RGR and Doubling time, citation pattern were employed. The study shows the linear growth in brain tumour research. There exists collaborative research among the Indian scientist. Indian papers were cited globally. Indian publications doubles once in seven years.

Key words: Bibliometric, brain tumour, Relative Growth Rate, Doubling time, authorship pattern, citation analysis

1. Introduction

The brain is a soft, spongy mass of *tissue*. It is protected by The **bones** of the skull, three **thin layers of tissue** (*meninges*), **Watery fluid** (*cerebrospinal fluid*) that flows through spaces between the meninges and through spaces (*ventricles*) within the brain. The brain directs the things one choose to do (like walking and talking) and the things our body does without thinking (like breathing). The brain is also in charge of our senses (sight, hearing, touch, taste, and smell), memory, emotions, and personality. A network of nerves carries messages back and forth between the brain and the rest of the body. Some nerves go directly from the brain to the eyes, ears, and other parts of the head. Other nerves run through the spinal cord to connect the brain with the other parts of the body. Within the brain and spinal cord, *glial cells* surround *nerve cells* and hold them in place.

When most normal *cells* grow old or get damaged, they die, and new cells take their place. Sometimes, this process goes wrong. New cells form when the body doesn't need them, and old or damaged cells don't die as they should. The buildup of extra cells often forms a mass of tissue called a growth or tumor. Primary brain tumors can be *benign* or *malignant*:

Benign brain tumors do not contain *cancer* cells. Usually, benign tumors can be removed, and they seldom grow back. Benign brain tumors usually have an obvious border or edge. Cells from benign tumors rarely invade tissues around them. They don't spread to other parts of the body. However, benign tumors can press on sensitive areas of the brain and cause serious health problems. Unlike benign tumors in most other parts of the body, benign brain tumors are sometimes life threatening. Benign brain tumors may become malignant.

Malignant brain tumors (also called **brain cancer**) contain cancer cells. - Malignant brain tumors are generally more serious and often are a threat to life. They are likely to

grow rapidly and crowd or invade the nearby healthy brain tissue. Cancer cells may break away from malignant brain tumors and spread to other parts of the brain or to the spinal cord. They rarely spread to other parts of the body.

In the US, about 2000 children and adolescents younger than 20 years of age are diagnosed with malignant brain tumors each year. Higher incidence rates were reported in 1985–94 than in 1975–83. There is some debate as to the reasons; one theory is that the trend is the result of improved diagnosis and reporting, In children under 2, about 70% of brain tumors are medulloblastoma, ependymoma, and low-grade glioma. Less commonly, and seen usually in infants, are teratoma and atypical teratoid rhabdoid tumor. Germ cell tumors, including teratoma, make up just 3% of pediatric primary brain tumors, but the worldwide incidence varies significantly.[1]

2 Bibliometric study

Bibliometric analysis is employed by the researchers to study the growth of literature in given field. Pritchard (1969) defined the term Bibliometric as the application of statistical and mathematical methods to books and other communication. The bibliometrics has emerged as a thrust area of research, incorporating different branches of human knowledge. There are famous Laws of Bibliometric i.e. Lotka's law (1926) of scientific productivity, Bradford's law (1934) of scattering and Zips law (1949) on frequency of words. But the Bibliometric studies started in late sixties.

3. Objectives

Main objectives of the study are:

i. To examine the worldwide research production in Brain Tumour during the period 1974-2013.

ii. To identify the document type of the publications in Brain Tumour.
iii. To identify the organisations conducting the research in Brain Tumour.
iv. To compare and measure the growth rate of literature published by Indian authors.
v. To identify and analyse the research contribution in the subject field of Brain Tumour.
vi. To identify the top source titles those carry the research productions in Brain Tumour.

4. Hypotheses

The following hypotheses are formulated for this study based on the objectives.

- There are more literatures worldwide published on Brain Tumour.
- Growth of publications in Brain Tumour is comparatively higher in developed countries.
- The research productivity in Brain Tumour is dominated by English language.
- Journals are major source of publications for Brain Tumour.
- Indian authors do contribute on brain tumour.
- There exists no steady growth in publication production in Brain Tumour research.

5. Methodology

For this study, the literature on Brain Tumour downloaded from online multidiscipline database 'Scopus' which is an international indexing and abstracting database. The term 'Brain Tumour' was used for retrieving literatures. A total of 147641 records were identified in the field of brain tumour worldwide during the period 1974-2013. Out of which 2880

(1.95%) publications were contributed by the Indian researchers. The collected data has been classified by using Excel and the same has been loaded into SPSS (statistical package for social sciences) for the purpose of analysis. Statistical tools such as frequency distribution and percentage analysis and Bibliometric techniques were used for the study. Analysis on year wise distribution, subject coverage and organisations which contributed papers were covered.

6. Results and Discussions

6.1 Country wise Distribution of Research in Brain Tumour.

Table 1 shows the country wise research articles published in Brain Tumour.

Table 1 Country wise Distribution

S.No.	Country	No. of articles	Percentage
1	United States	47354	32.07
2	Japan	14508	9.83
3	Germany	12032	8.15
4	United Kingdom	7615	5.16
5	France	7157	4.85
6	Italy	7133	4.83
7	China	5916	4.01
8	Canada	5125	3.47
9	Spain	3366	2.28
10	India	2880	1.95
11	Netherlands	2744	1.86
12	Switzerland	2643	1.79
13	South Korea	2371	1.61
14	Australia	2170	1.47
15	Sweden	2085	1.41
16	Turkey	1874	1.27
17	Taiwan	1635	1.11
18	Belgium	1526	1.03
19	Others	17507	11.86
Total		**147641**	**100.00**

It is seen from the Table that Collaborative Research have been carried out in the area of Brain tumour beyond the territory.

United States of America holds the key position with 47354 (32.07%) of total publications followed by Japan and Germany. It is also seen from the table that India holds 10th place with 2880 (1.95%) publications.

6.2 Year wise Distribution of Research Productivity by Indian Authors

Table 1 shows the year wise research productivity on Brain Tumour by Indian authors. The Highest number of research productivity is in 2011 with a total number of publications is records is 341 (11.8%)

Table 2 Year wise Contribution

S.No.	Year	No. of publications	Cum Publication	Percentage	Cumulative Percentage
1	1974	16	16	0.6	0.6
2	1975	4	20	0.1	0.7
3	1976	18	38	0.6	1.3
4	1977	8	46	0.3	1.6
5	1978	12	58	0.4	2
6	1979	4	62	0.1	2.2
7	1980	14	76	0.5	2.6
8	1981	11	87	0.4	3
9	1982	11	98	0.4	3.4
10	1983	7	105	0.2	3.6
11	1984	5	110	0.2	3.8
12	1985	7	117	0.2	4.1
13	1986	9	126	0.3	4.4
14	1987	12	138	0.4	4.8
15	1988	13	151	0.5	5.2
16	1989	16	167	0.6	5.8
17	1990	10	177	0.3	6.1
18	1991	13	190	0.5	6.6
19	1992	19	209	0.7	7.3
20	1993	24	233	0.8	8.1
21	1994	27	260	0.9	9
22	1995	34	294	1.2	10.2
23	1996	40	334	1.4	11.6
24	1997	34	368	1.2	12.8
25	1998	40	408	1.4	14.2
26	1999	47	455	1.6	15.8

27	2000	59	514	2	17.8
28	2001	70	584	2.4	20.3
29	2002	69	653	2.4	22.7
30	2003	104	757	3.6	26.3
31	2004	116	873	4	30.3
32	2005	124	997	4.3	34.6
33	2006	122	1119	4.2	38.9
34	2007	142	1261	4.9	43.8
35	2008	171	1432	5.9	49.7
36	2009	199	1631	6.9	56.6
37	2010	257	1888	8.9	65.6
38	2011	341	2229	11.8	77.4
39	2012	334	2563	11.6	89
40	2013	317	2880	11	100

It can be seen from the table, that their exist uniform growth in publications. During the year 2011 onwards, nearly 11% growth can be seen. Up to 1994 the growth is less than 1%.

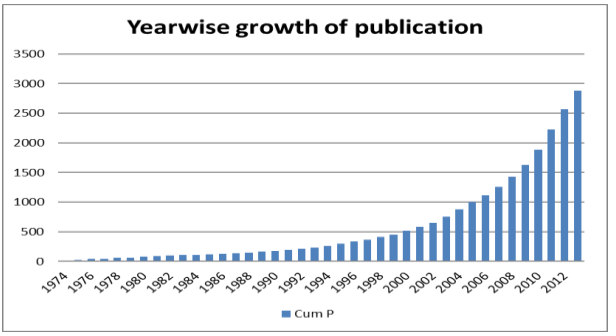

Fig. 1 Yearwise growth of publications.

It can be seen from the figure that the growth is parabolic in nature.

6.3 Block yearwise Distribution of publications

In order to identify the exact period of growth, the analysis is made based on block year wise distribution. The study period has been grouped into four block years of ten years period.

Table 3 Block yearwise Distribution

S.No	Year	No. of papers	Percentage	Cumulative Percent
1	1974-1983	105	3.6	3.6
2	1984-1993	128	4.4	8.1
3	1994-2003	524	18.2	26.3
4	2004-2013	2123	73.7	100.0
Total		**2880**	**100.0**	

It is seen from table 4 that in the block year 2004-2013 has more publications compared to other three block years. In the block year 2004-2013, there were 2123 (73.7%) publications. It shows that in the recent years, the growth of literature in brain tumour is getting increased. It clearly indicates that the brain tumour has a greater impact during the period 2004-2013.

6.4 Bibliographic Form

The publications in Brain Tumour were contributed in different bibliographic forms such as articles, reviews, conference papers, letters, book chapters, notes, etc and the same is shown in Table 4.

Table 4 Bibliographic Form

S,No.	Document type	No. of Publications	Percentage
1	Journals	2131	73.99%
2	Review	334	11.59%
3	Conference Paper	161	5.59%
4	Letter	147	5.25%
5	Note	20	069%
6	Editorial	17	0.59%
7	Book Chapter	12	0.43%
8	Short Survey	11	0.39%
9	Undefined	47	1.63%
Total		**2880**	**100%**

Table 4 shows that maximum number of publications were journal articles 2131 (73.99%). It is followed by reviews 334 (11.59%) , Conference proceedings 161 (5.59) and letters 147 (5.25). The contributions in other bibliographic forms were very less.

The majority of the Indian research outputs were published in English ie. 2872. The remaining publications were published four in Turkesh, three in Polish and one in French.

6.5 Source Titles and Brain Tumour Research Productivity

Sources of publishing in brain tumour that has Indian research publications were listed in the table 6.

Table 5 Source Title

S.No	Source Title	No. of Publications	Percentage
1	Neurology India	246	8.54
2	British Journal of Neurosurgery	66	2.29
3	Journal of Clinical Neuroscience	61	2.12
4	Child S Nervous System	53	1.84
5	Indian Journal of Radiology and Imaging	50	1.74
6	Acta Neurochirurgica	47	1.63
7	Journal of Neuro Oncology	46	1.60
8	Indian Journal of Pediatrics	43	1.49
9	Indian Journal of Cancer	42	1.46
10	Indian Journal of Pathology and Microbiology	41	1.42
11	Journal of Cancer Research and Therapeutics	38	1.32
12	Journal of Pediatric Neurosciences	37	1.28
13	Pediatric Neurosurgery	32	1.11
14	Surgical Neurology	30	1.04
15	Clinical Neurology and Neurosurgery	25	0.87
16	Journal of Neurosciences in Rural Practice	25	0.87

Nearly 246 publications were published in “Neurology India”. It is followed by “British Journal of Neurosurgey” 66 (2.29%) and “Journal of Clinical Neuroscience” 61 (2.12%).

6.6 Relative Growth Rate (RGR) and Doubling Time (Dt)

The relative growth rate and doubling time has been calculated and the same is shown in table 6.

Table 6 Relative Growth Rate (RGR) and Doubling Time (Dt)

S.No.	Year	No. of publications	Cum Publication	Cum Percentage	w1	w2	RGR	Dt
1	1974	16	16	0.6		2.772589	2.77	0.25
2	1975	4	20	0.7	2.772589	2.995732	0.22	3.11
3	1976	18	38	1.3	2.995732	3.637586	0.64	1.08
4	1977	8	46	1.6	3.637586	3.828641	0.19	3.63
5	1978	12	58	2	3.828641	4.060443	0.23	2.99
6	1979	4	62	2.2	4.060443	4.127134	0.07	10.39
7	1980	14	76	2.6	4.127134	4.330733	0.20	3.40
8	1981	11	87	3	4.330733	4.465908	0.14	5.13
9	1982	11	98	3.4	4.465908	4.584967	0.12	5.82
10	1983	7	105	3.6	4.584967	4.65396	0.07	10.04
11	1984	5	110	3.8	4.65396	4.70048	0.05	14.90
12	1985	7	117	4.1	4.70048	4.762174	0.06	11.23
13	1986	9	126	4.4	4.762174	4.836282	0.07	9.35
14	1987	12	138	4.8	4.836282	4.927254	0.09	7.62
15	1988	13	151	5.2	4.927254	5.01728	0.09	7.70
16	1989	16	167	5.8	5.01728	5.117994	0.10	6.88
17	1990	10	177	6.1	5.117994	5.17615	0.06	11.92
18	1991	13	190	6.6	5.17615	5.247024	0.07	9.78
19	1992	19	209	7.3	5.247024	5.342334	0.10	7.27
20	1993	24	233	8.1	5.342334	5.451038	0.11	6.38
21	1994	27	260	9	5.451038	5.560682	0.11	6.32
22	1995	34	294	10.2	5.560682	5.68358	0.12	5.64
23	1996	40	334	11.6	5.68358	5.811141	0.13	5.43
24	1997	34	368	12.8	5.811141	5.908083	0.10	7.15
25	1998	40	408	14.2	5.908083	6.011267	0.10	6.72
26	1999	47	455	15.8	6.011267	6.120297	0.11	6.36
27	2000	59	514	17.8	6.120297	6.242223	0.12	5.68
28	2001	70	584	20.3	6.242223	6.369901	0.13	5.43
29	2002	69	653	22.7	6.369901	6.481577	0.11	6.21
30	2003	104	757	26.3	6.481577	6.629363	0.15	4.69
31	2004	116	873	30.3	6.629363	6.771936	0.14	4.86
32	2005	124	997	34.6	6.771936	6.904751	0.13	5.22
33	2006	122	1119	38.9	6.904751	7.020191	0.12	6.00
34	2007	142	1261	43.8	7.020191	7.13966	0.12	5.80
35	2008	171	1432	49.7	7.13966	7.266827	0.13	5.45
36	2009	199	1631	56.6	7.266827	7.396949	0.13	5.33
37	2010	257	1888	65.6	7.396949	7.543273	0.15	4.74
38	2011	341	2229	77.4	7.543273	7.709308	0.17	4.17
39	2012	334	2563	89	7.709308	7.848934	0.14	4.96
40	2013	317	2880	100	7.848934	7.965546	0.12	5.94
Total		**2880**						

The relative growth rate ranges between 2.772529 and.7.848934l.

6.7 Author Productivity

The top ten Indian authors were identified and the same is shown in Table 7 along with their number of contributions.

Table 7 Indian Authors

S.No	Authors	Title	Percentage (N=2880)
1	Sarkar, C.	129	4.48
2	Sharma, M.C.	104	3.61
3	Mahapatra, A.K.	87	3.02
4	Goel, A.	80	2.78
5	Santosh, V.	52	1.81
6	Gupta, R.K.	44	1.53
7	Behari, S.	43	1.49
8	Kumar, R.	43	1.49
9	Jalali, R.	42	1.46
10	Suri, V.	41	1.42
11	Rajshekhar, V.	41	1.42
12	Garg, A.	38	1.32
13	Shankar, S.K.	37	1.28
14	Radhakrishnan, V.V.	33	1.15
15	Suri, A.	32	1.11
16	Mehta, V.S.	31	1.08

Out of 16 Indian authors, Sarkar, C has 129 (4.48%) publications. It followed by Sharma, M C 104 (3.61%), Mahapatra, A K 87 (3.02%) and Goel, A with 80 (2.78%) publications.

6.8 Organisations and Brain Tumour Research

The organisations contributing research publications in Brain Tumour were identified and the same is shown in Table 8.

Table 8 Organisation

S.No.	Institution	No. of Papers	Percentage
1	All India Institute of Medical Sciences	367	12.74
2	Sanjay Gandhi Postgraduate Institute of Medical Sciences Lucknow	161	5.59
3	National Institute of Mental Health and Neuro Sciences	146	5.07
4	Postgraduate Institute of Medical Education and Research	136	4.72
5	Tata Memorial Hospital	114	3.96
6	King Edward Memorial Hospital India	110	3.82
7	Sree Chitra Tirunal Institute for Medical Sciences and Technology	101	3.51
8	Christian Medical College, Vellore	97	3.37

9	Chhatrapati Shahuji Maharaj Medical University	60	2.08
10	Institute of Nuclear Medicine and Allied Sciences India	41	1.42
11	National Brain Research Centre	40	1.39
12	University Institute of Pharmaceutical Sciences India	40	1.39
13	Nizam's Institute of Medical Sciences	39	1.35
14	G.B. Pant Hospital India	38	1.32
15	Anna University	37	1.28
16	Sri Sathya Sai Institute of Higher Medical Sciences	35	1.22
17	Kasturba Medical College, Manipal	33	1.15
18	Indian Institute of Science	29	1.01
19	Sher-I-Kashmir Institute of Medical Sciences	28	0.97
20	Indian Institute of Technology, Kanpur	26	0.90
21	Others	1202	41.74
Total		**2880**	**100.00**

Table 8 shows that All India Institute of Medical Sciences holds first place in contributing research productions in Brain Tumour with 367 (12.74%) of the total publications of 2880 Sanjay Gandhi Postgraduate Institute of Medical Sciences Lucknow with 161 (5.59%) and National Institute of Mental Health and Neuro Sciences with 146 (5.07%). It is interesting to note that other than the medical institutions, 92 (3.19%) publications were contributed from non-medical institutions.

6.9 Collaborated Countries

The country of origin of the collaborated authors with the indian authors were identified and the same shown in Table 9.

Table 9 Collaborated Countries

S.No	Country Collaborated	No. of Papers	Percentage (N=2740)
1	United States	181	6.61
2	United Kingdom	33	1.20
3	Germany	24	0.88
4	Canada	18	0.66
5	Japan	17	0.62
6	France	16	0.58
7	Italy	14	0.51
8	Saudi Arabia	13	0.47
9	Spain	13	0.47
10	Australia	12	0.44
11	Singapore	8	0.29
12	Netherlands	8	0.29
13	China	7	0.26

14	Finland	7	0.26
15	South Korea	7	0.26
16	Switzerland	7	0.26
17	Belgium	6	0.22
18	Poland	6	0.22
19	Brazil	5	0.18

It is to note that Indian authors collaborate mostly with United States where the no. of publications were 181 (6.61%) followed by United Kingdom and Germany. This trend shows that United States concentrates more on brain tumour compared with other countries. The Indian authors were also preferred to collaborate with United States rather than other countries.

6.10 Author Pattern

The authorship pattern in respect of Indian authors is presented in Table 10. Single author publications was less compared to multiple authors.

Table 10 Author Pattern

S.No	Authors	Frequency	Percentage
1	Single author	140	4.9
2	Two authors	499	17.3
3	Three authors	558	19.4
4	Four authors	564	19.6
5	Five authors	394	13.7
6	More than five	725	25.2
Total		**2880**	**100.0**

It is seen from the table that out of 2880 publications, 725 (25.2%) publications were by more than five authors followed by four, three and two authors. Around 2740 (95.1%) publications were by multiple authors. It shows that the authors prefer to publish with co-authors rather publishing the article as single author.

6.11 Yearwise Publications by Author Pattern

The yearwise and block yearwise publications are calculated based on authorship pattern is presented in Table 11 and table 12.

Table 11 Author Pattern Vs Yearwise

S.No.	Year	Single author	Two authors	Three authors	Four authors	Five authors	More than five	Total
1	1974	2 0.10%	8 0.30%	5 0.20%	1 0.00%	0 0.00%	0 0.00%	16 0.60%
2	1975	0 0.00%	2 0.10%	1 0.00%	0 0.00%	1 0.00%	0 0.00%	4 0.10%
3	1976	2 0.10%	4 0.10%	7 0.20%	5 0.20%	0 0.00%	0 0.00%	18 0.60%
4	1977	0 0.00%	1 0.00%	4 0.10%	3 0.10%	0 0.00%	0 0.00%	8 0.30%
5	1978	2 0.10%	0 0.00%	4 0.10%	4 0.10%	1 0.00%	1 0.00%	12 0.40%
6	1979	0 0.00%	1 0.00%	2 0.10%	1 0.00%	0 0.00%	0 0.00%	4 0.10%
7	1980	0 0.00%	2 0.10%	7 0.20%	3 0.10%	1 0.00%	1 0.00%	14 0.50%
8	1981	0 0.00%	2 0.10%	4 0.10%	2 0.10%	1 0.00%	2 0.10%	11 0.40%
9	1982	2 0.10%	2 0.10%	2 0.10%	4 0.10%	1 0.00%	0 0.00%	11 0.40%
10	1983	2 0.10%	1 0.00%	3 0.10%	1 0.00%	0 0.00%	0 0.00%	7 0.20%
11	1984	0 0.00%	0 0.00%	3 0.10%	2 0.10%	0 0.00%	0 0.00%	5 0.20%
12	1985	1 0.00%	2 0.10%	2 0.10%	1 0.00%	0 0.00%	1 0.00%	7 0.20%
13	1986	0 0.00%	4 0.10%	1 0.00%	1 0.00%	2 0.10%	1 0.00%	9 0.30%
14	1987	0 0.00%	2 0.10%	6 0.20%	2 0.10%	1 0.00%	1 0.00%	12 0.40%
15	1988	1 0.00%	2 0.10%	3 0.10%	2 0.10%	2 0.10%	3 0.10%	13 0.50%
16	1989	1 0.00%	5 0.20%	4 0.10%	1 0.00%	2 0.10%	3 0.10%	16 0.60%
17	1990	1 0.00%	3 0.10%	2 0.10%	2 0.10%	1 0.00%	1 0.00%	10 0.30%
18	1991	0 0.00%	3 0.10%	3 0.10%	2 0.10%	0 0.00%	5 0.20%	13 0.50%
19	1992	0	4	2	6	5	2	19

		0.00%	0.10%	0.10%	0.20%	0.20%	0.10%	0.70%
20	1993	1 0.00%	3 0.10%	2 0.10%	4 0.10%	6 0.20%	8 0.30%	24 0.80%
21	1994	2 0.10%	3 0.10%	4 0.10%	10 0.30%	2 0.10%	6 0.20%	27 0.90%
22	1995	5 0.20%	6 0.20%	12 0.40%	5 0.20%	4 0.10%	2 0.10%	34 1.20%
23	1996	3 0.10%	6 0.20%	12 0.40%	8 0.30%	3 0.10%	8 0.30%	40 1.40%
24	1997	5 0.20%	8 0.30%	5 0.20%	6 0.20%	3 0.10%	7 0.20%	34 1.20%
25	1998	1 0.00%	5 0.20%	13 0.50%	7 0.20%	8 0.30%	6 0.20%	40 1.40%
26	1999	7 0.20%	7 0.20%	11 0.40%	7 0.20%	8 0.30%	7 0.20%	47 1.60%
27	2000	1 0.00%	8 0.30%	11 0.40%	8 0.30%	16 0.60%	15 0.50%	59 2.00%
28	2001	4 0.10%	9 0.30%	16 0.60%	19 0.70%	9 0.30%	13 0.50%	70 2.40%
29	2002	4 0.10%	10 0.30%	11 0.40%	18 0.60%	10 0.30%	16 0.60%	69 2.40%
30	2003	4 0.10%	14 0.50%	15 0.50%	22 0.80%	18 0.60%	31 1.10%	104 3.60%
31	2004	10 0.30%	20 0.70%	19 0.70%	18 0.60%	14 0.50%	35 1.20%	116 4.00%
32	2005	7 0.20%	25 0.90%	21 0.70%	18 0.60%	18 0.60%	35 1.20%	124 4.30%
33	2006	5 0.20%	16 0.60%	19 0.70%	25 0.90%	20 0.70%	37 1.30%	122 4.20%
34	2007	4 0.10%	12 0.40%	23 0.80%	30 1.00%	29 1.00%	44 1.50%	142 4.90%
35	2008	3 0.10%	26 0.90%	28 1.00%	31 1.10%	31 1.10%	52 1.80%	171 5.90%
36	2009	7 0.20%	28 1.00%	35 1.20%	39 1.40%	22 0.80%	68 2.40%	199 6.90%
37	2010	12 0.40%	40 1.40%	62 2.20%	47 1.60%	34 1.20%	62 2.20%	257 8.90%
38	2011	15 0.50%	61 2.10%	60 2.10%	67 2.30%	39 1.40%	99 3.40%	341 11.80%
39	2012	8 0.30%	62 2.20%	63 2.20%	80 2.80%	42 1.50%	79 2.70%	334 11.60%
40	2013	18 0.60%	82 2.80%	51 1.80%	52 1.80%	40 1.40%	74 2.60%	317 11.00%
Total		**140 4.90%**	**499 17.30%**	**558 19.40%**	**564 19.60%**	**394 13.70%**	**725 25.20%**	**2880 100.00%**

Table 12 Author Pattern Vs Block year

S.No	Block Year	No. of Author Pattern						Total
		Single author	Two authors	Three authors	Four authors	Five authors	More than five authors	
1	1974-1983	10 0.3%	23 0.8%	39 1.4%	24 0.8%	5 0.2%	4 0.1%	105 3.6%
2	1984-1993	5 0.2%	28 1.0%	28 1.0%	23 0.8%	19 0.7%	25 0.9%	128 4.4%
3	1994-2003	36 1.3%	76 2.6%	110 3.8%	110 3.8%	81 2.8%	111 3.9%	524 18.2%
4	2004-2013	89 3.1%	372 12.9%	381 13.2%	407 14.1%	289 10.0%	585 20.3%	2123 73.7%
Total		**140 4.9%**	**499 17.3%**	**558 19.4%**	**564 19.6%**	**394 13.7%**	**725 25.2%**	**2880 100.0%**

It is seen from the table 11 and 12 that more no. of articles 2123 (73.7%) were published during the block year 2004-2013 wherein 585 (20.3%) papers were published by more than five authors. 524 (18.2%) articles were published during the block year 1994-2003 in which 331 publications were made by more than three authors. It is also seen from the table that out of 2880 publications, 725 (25.2%) publications were published by more than five authors.

6.12 Average author

Average author per Indian contributions were calculated and the same is shown in Table 13. Similarly averge page per paper and citations were also calculated. Average authrs, pages and citation were shown in table 13**.**

Table 13 Average authors, citations and pages for Indian brain tumour publications.

S.No.	Year	No of Publications	Total authors	No. of citation	Pages	Avg. authors	Avg. citation	Avg pages
1	1974	16	37	22	73	2.31	1.38	4.56
2	1975	4	12	5	14	3.00	1.25	3.50
3	1976	18	51	25	99	2.83	1.39	5.50
4	1977	8	26	14	42	3.25	1.75	5.25
5	1978	12	43	17	68	3.58	1.42	5.67
6	1979	4	12	4	15	3.00	1.00	3.75

7	1980	14	48	109	75	3.43	7.79	5.36
8	1981	11	41	4	50	3.73	0.36	4.55
9	1982	11	33	41	70	3.00	3.73	6.36
10	1983	7	17	32	44	2.43	4.57	6.29
11	1984	5	17	7	27	3.40	1.40	5.40
12	1985	7	21	37	35	3.00	5.29	5.00
13	1986	9	32	40	39	3.56	4.44	4.33
14	1987	12	41	97	59	3.42	8.08	4.92
15	1988	13	51	85	80	3.92	6.54	6.15
16	1989	16	56	85	82	3.50	5.31	5.13
17	1990	10	32	63	50	3.20	6.30	5.00
18	1991	13	58	128	55	4.46	9.85	4.23
19	1992	19	76	170	79	4.00	8.95	4.16
20	1993	24	111	216	106	4.63	9.00	4.42
21	1994	27	108	187	141	4.00	6.93	5.22
22	1995	34	106	715	198	3.12	21.03	5.82
23	1996	40	163	771	186	4.08	19.28	4.65
24	1997	34	121	377	163	3.56	11.09	4.79
25	1998	40	157	542	220	3.93	13.55	5.50
26	1999	47	171	578	236	3.64	12.30	5.02
27	2000	59	261	659	355	4.42	11.17	6.02
28	2001	70	274	948	358	3.91	13.54	5.11
29	2002	69	284	961	345	4.12	13.93	5.00
30	2003	104	469	1344	541	4.51	12.92	5.20
31	2004	116	521	1299	665	4.49	11.20	5.73
32	2005	124	568	1855	783	4.58	14.96	6.31
33	2006	122	545	1905	729	4.47	15.61	5.98
34	2007	142	683	2069	878	4.81	14.57	6.18
35	2008	171	847	2053	1178	4.95	12.01	6.89
36	2009	199	963	1926	1253	4.84	9.68	6.30
37	2010	257	1147	1891	1677	4.46	7.36	6.53
38	2011	341	1576	1972	2414	4.62	5.78	7.08
39	2012	334	1527	1321	2292	4.57	3.96	6.86
40	2013	317	1352	421	2324	4.26	1.33	7.33
Total		**2880**	**12658**	**24995**	**18098**	**4.40**	**8.68**	**6.28**

On an average 4.40 authors per articles. Similarly each articles has 8.68 citations and 6.28 average pages per articles. Similarly growth authors, pages, citations were identified and the same is shown in Table 14.

Table No. 14 Average author vs Block yearwise

S.No	Block Year	No. of papers	No. of author	No. of pages	Cited by	Avg. Author	Avg Page	Avg. Cited
1	1974-1983	105	318	550	273	3.03	5.24	2.60
2	1984-1993	128	482	612	928	3.77	4.78	7.25
3	1994-2003	524	2029	2743	7082	3.87	5.23	13.52
4	2004-2013	2123	8559	14193	16712	4.03	6.69	7.87

During the block year 1994-2003, average citation work out to 13.52. Average pages per article works out to 6.69 during the block period 2004-2013. There exists collaborative research in brain tumour publications.

Conclusion

There are 147641 publications available in Scopus database worldwide in Brain Tumour wherein India bags 2880 (1.95%) publications and placed in the 10th position. The most popular subjects of research are Medicine, Biochemistry, Genetics and Molecular Biology, and Neuroscience. In order to bring about more balance in future between different subfields of Brain Tumour, more attention and funding needs to be focused. The lack of fund to the research is a major drawback to the researchers.

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