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Brain Tumor Research Publication During The Period 2012-2021: A Scientometric Study.

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Abstract

The study looked at various Scientometrics parameters in brain tumor research from 2012 to 2021. The number of brain tumor research papers published each year is increasing, with a peak of 8347 (15.21%) published in 2021. The RGR of the article gradually decreased in the source type distribution of Brain Tumour research output, in which a maximum of 50128(91.34%) of research papers were published in Journals. On the other hand, the articles' doubling time gradually increased. The document-type distribution of brain tumor research output for the article accounts for 39158 (71.35%) of total publications, with the author contributing a maximum of 218 (14.23%) publications. Single authors contribute to the authorship pattern of 3090 research publications, and the average level of degree of collaboration is 0.94. The median CC is 0.72, the median CI is 4.60, and the median MCC is 4.60. According to the institution analysis, the majority of the articles are in the Harvard Medical School, with 1450 (15.89%) publications. The United States contributed the most articles, accounting for more than 17921 (35.81%) of the total publications. With 9095 citations, the most cited work is Louis, D.N., et al., (2016) The 2016 World Health Organisation Classification of Tumours of the Central Nervous System. Acta Neuropathologica, vol. 131(6), 803-820.

Keywords: Scientometrics, Bibliometric, Related Citation Index, Degree of collaboration, Collaborative index measure, RGR, and doubling time, Time series analysis, highly cited papers.

Introduction

A brain tumor diagnosis can be both frightening and life-changing. If your doctor feels you have a brain tumor, seek the counsel of additional specialists who specialize in cerebral tumor diagnosis and treatment. Because the brain is such a complicated and critical organ, treatment frequently has long-term implications. Expert advice and current scientific information on treatment choices for the specific type of brain tumor are crucial. Concerning the brain and the nervous system: The central nervous system (CNS) is made up of the brain and the spinal column and governs all vital activities. These functions include things like thinking, speaking, and moving your body. The possibility of being diagnosed with a brain tumor can be a shocking and life-changing event. If your doctor suspects a brain tumor, it is important to seek out other doctors specialized in diagnosing and treating brain tumors. The brain is a complex and vital organ, and treatment often causes life-long changes. It is important to get specialists' opinions and updated medical information about treatment options for the specific type of brain tumor. About the brain and central nervous system: The brain and spinal column make up the central nervous system (CNS), where all vital functions are controlled. These functions include thought speech and body movements. This means that when a tumor grows in the CNS, it can affect a person's thought processes or the way they talk or move. Anatomy of the brain**:** The brain is made up of 3 main parts: the

cerebrum, the cerebellum, and the brain stem. The meninges, which surround the brain, are also considered part of the brain.1

Scientometrics Study:

Cole and Eales (1917)2 employed mathematical techniques to analyze the literature in their publication on the history of comparative anatomy. Hulme (1923)3, who produced the book Statistical Bibliography, made the most significant contribution. This phrase was previously restricted to statistical metrics until the end of the 1960s. Ranganathan (1948)4 developed the word librametry to characterize the use of statistical and numerical methods to measure diverse library operations and services. The term "bibliometrics" was coined by Alan Prichard (1969)5 to characterize the application of quantitative and numerical methods to books and other media, the process of written communication, and the nature and scope of a profession. Van Raan and colleagues (1997)6 specialize in mathematical investigations of the fields of science and technology.

Review of literature

Chen et al. (2020)[7] Using a website of science database, they performed a scientometric analysis on the progression and prognosis of recurrent Glioma. According to the conclusions of the study, the author examined the highest number of most referenced articles out of 4651 articles. The most Hundred cited articles on recurrent glioma garnered 149 to 1471 citations, with the majority of these articles appearing in oncology-specific journals (66) and submitted by US institutions (n = 67). According to the data, the key difficulty is the treatment of recurrent glioma.

Shukla (2019)[8] used the Scopus database to conduct a scientometric study on the literature on jaundice disease for the period (1998-2017). It was discovered that a total of 3193 articles on jaundice disease were published, with the highest number of papers published between 2012 and 2015. This investigation also indicated that the year 2000 had the greatest yearly rate of expansion and the year 2017 had the fastest doubling time. S K Sarin of the Institute of Liver and Biliary Sciences, Department of Hepatology in New Delhi was the least active author, with 26 contributions, a 65 h-index, and 16691 citations. Ghosh, K was the most prolific author, with a total of 5078 citations a maximum of 66 contributions, and a 30 h-index. During the period of study. Medicine had the most records with 2421, followed by biochemistry, genetics, and molecular biology with 1435 records from the specified time period of study.

Bansal, M., Gupta, R., and Bansal, J. (2017)[9] retrieved data from the Scopus database for scientometric research of celiac disease World Publication Output from 2005 to 2014. According to the paper, there are 14317 publications on celiac disease, with a typical yearly increase of 5.20% and a citation impact of 12.53. Between 2005 and 2014, the 15 strongest countries provided 83.89% of global output, with the United States accounting for the lion's share (21.40%), subsequent to Italy (12.61%), the United Kingdom (8.23%), Germany (5.41%), and so on. From 2005 to 2014, the 15 strongest organizations, authors, and journals produced 15.06%, 10.71%, and 16.57% of global article production, respectively.

Nagalingam (2017)[10] searched the Scopus database for data for a scientometric analysis of Parkinson's disease research trends in Asia from 2010 to 2017. According to the study, 14064 papers on this disease research were published during this time period. Documents with more than three authors ranked first in the study, with Parkinsonism and related disorders receiving the most documents, followed by Plos One and Neuroscience letters, and so on. China surpassed Japan as the most productive country, and Hattori, N. surpassed Tan, E.K. as the most productive author.

Ramesh, Gopalakrishnan, and Balasubramani (2014)[11] used the Scopus database to conduct a bibliometric study on the growth of Indian research output on Brain Tumors. According to the study's findings, India produces 2880 (1.95%) of the total 147641 articles on Brain Tumor. In 2011, the most research articles (341) were published. 725 (25.2%) of the total 2880 Indian publications had more than five authors, while only 140 (4.9%) were single-authored. The largest number of the articles (73.9%) were in the document type of journals. reviews (11.59%), conference papers (5.59%), and so on. Indian authors collaborated with US authors on 3 181 (6.61%) of the publications. Sarkar, C. was the most prolific author, with 129 (4.48%) publications. M.C. Sharma contributed 104 (3.61%) publications.

Objectives of the study

The main objectives of the study are as follows:

- To examine the year-wise growth of publications in Brain Tumor research.
- To identify the document-wise distribution of publications.
- To analyze the most productive author with their publications.
- To analyze the RGR doubling time research publications
- To analyze the degree of collaboration and authorship pattern
- To analyze the collaborative measure (CC, CI, MCC)
- To identify the institution-wise, and Journals-wise distribution of publications.
- To analyze the country-wise distribution of research publications
- To analyze the most preferred keywords, and funding agencies in brain tumor research.
- To identify the time series analysis, and highly cited paper research publications

Methodology

The data for the present study were retrieved from the Scopus database for the scientometric analysis of Brain tumor research for a period of ten years, i.e. 2012-2021, and the following search string was used to collect the data for the study: (TITLE-ABS-KEY ("Brain tumor") AND PUBYEAR > 2011 AND PUBYEAR < 2022 AND PUBYEAR > 2011 AND PUBYEAR < 2022). The Microsoft Excel application software was used to tabulate and examine the data. The information was gathered on November 23, 2022.

Information assessment and interpretation

Year-wise distribution of Brain Tumor research

Table - 1 Year-wise distribution of Brain Tumor research

S.No	year	Publications	%	Citations	%	Cited	%	Uncited	%	CPP	RCI
1	2012	3439	6.27	118051	10.89	2977	6.33	462	5.91	34.33	1.74
2	2013	3408	6.21	112682	10.39	2941	6.25	467	5.98	33.06	1.67
3	2014	3915	7.13	109330	10.08	3447	7.32	468	5.99	27.93	1.41
4	2015	4236	7.72	118422	10.92	3747	7.96	489	6.26	27.96	1.41
5	2016	4753	8.66	128679	11.87	4236	9.00	517	6.62	27.07	1.37
6	2017	5591	10.19	131659	12.14	5003	10.63	588	7.53	23.55	1.19
7	2018	6555	11.94	133983	12.36	5878	12.49	677	8.67	20.44	1.03
8	2019	7125	12.98	111171	10.25	6235	13.25	890	11.39	15.60	0.79
9	2020	7509	13.68	80423	7.42	6433	13.67	1076	13.78	10.71	0.54
10	2021	8347	15.21	39860	3.68	6170	13.11	2177	27.87	4.78	0.24
	Total	54878	100.00	1084260	100.00	47067	100.00	7811	100.00		

In the Table 1 observation of the particular table, it has been shown that the frequency of brain tumor publications is extremely high in the present era compared to the beginning years of the study. Brain tumors research papers show an increasing trend, A maximum of 8347(15.21%) of the research papers was released in the year 2021, followed by 2020 with 7509(13.68%) publications and the third-highest publications year was 2019 in which a total of 7125(12.98%) of research papers were published in brain tumor research from the period of study.

The highest number of citations is 133983(12.36%) for research publications, followed by 5878(12.49%) for cited publications and 677(8.67%) for uncited publications, with a CPP of 20.44 and an RCI of 1.03. Following that are 131659 (12.14%) research publications, 5003 (10.63%) cited publications, and 588 (7.53%) uncited publications. The CPP is 23.55, and the RCI is 1.19. The lowest number of citations is 39860 (3.68%), the cited publications are 6170 (13.11%), the uncited publications are 2177 (27.87%), the CPP is 4.78, and the RCI is 0.24

Source type distribution of the publication in Brain Tumor research

Table 2 Source type distribution of the publication in Brain Tumor research

S.No	Source types	Publications	%
1	Journal	50128	91.34
2	Conference Proceeding	2096	3.82
3	Book Series	1491	2.72
4	Book	1085	1.98
5	Trade Journal	9	0.02
6	Undefined	69	0.13
		54878	100.00

Table 2 depicts the distribution of Brain Tumor research output by source type, with a maximum of 50128 (91.34%) research papers published in Journals, followed by Conference Proceeding with 2096 (3.82%) of each paper contributions, Book Series with 1491 2.72%) of publications, Book with 1085 (1.98%) papers, and Trade Journal with only 9 (0.02%) papers contributed over the course of the research.

RGR and Doubling time of Brain Tumor

Table 3 Relative Growth Rate and Doubling Time of Brain Tumor

S.No	Years	Publications	Cumulative	W^1	W^2	RGR=(W2-W1)	Dt=(0.693/RGR
1	2012	3439	3439		8.14		
2	2013	3408	6847	8.14	8.83	0.69	1.01
3	2014	3915	10762	8.83	9.28	0.45	1.53
4	2015	4236	14998	9.28	9.62	0.33	2.09
5	2016	4753	19751	9.62	9.89	0.28	2.52
6	2017	5591	25342	9.89	10.14	0.25	2.78
7	2018	6555	31897	10.14	10.37	0.23	3.01
8	2019	7125	39022	10.37	10.57	0.20	3.44
9	2020	7509	46531	10.57	10.75	0.18	3.94
10	2021	8347	54878	10.75	10.91	0.16	4.20
	Total	54878					

Table 3 clearly illustrates the mean relative growth rate and doubling time of brain tumor publications during the study period. During the study period, the RGR of a paper increased over time from 0.69 in 2013 to 0.16 in 2021. The time it takes to publish an item doubles and gradually grows from 1.01 in 2013 to 4.20 in 2021. The above discussion can be summed up by stating that the RGR of the paper progressively declined. On the other hand, the articles' doubling time gradually rose.

Document Type Distribution of Publications on Brain Tumor Research

Table 4 Document Type Distribution of Publications on Brain Tumor Research

S.No	Document Type	Publications	%	Cumulative	%
1	Article	39158	71.35	39158	5.37
2	Review	7248	13.21	46406	6.37
3	Conference Paper	2982	5.43	49388	6.78
4	Book Chapter	1467	2.67	50855	6.98
5	Letter	1397	2.55	52252	7.17
6	Note	1111	2.02	53363	7.32
7	Editorial	740	1.35	54103	7.42
8	Short Survey	274	0.50	54377	7.46
9	Conference Review	224	0.41	54601	7.49
10	Erratum	125	0.23	54726	7.51
11	Book	80	0.15	54806	7.52
12	Retracted	68	0.12	54874	7.53
13	Data Paper	2	0.00	54876	7.53
14	Undefined	2	0.00	54878	7.53
	total	54878	100.00	728663	100.00

Table 4 depicts the document-type distribution of brain tumor research output during the study period. According to the analysis, the share of articles is first, accounting for 39158 (71.35%) of total publications. The Review with research publication occupies 7248(13.21%) and was in second place, with Conference Papers contributing 2982(5.43%), Book chapters contributing 1467(2.67%), Letter contributing 1397(2.55%), and Note contributing 1111(2.02%), Editorial, Short survey, Conference review, Erratum, 740(1.35%), 274(0.50%), 224(0.41%), 125(0.23%), Book, Retracted, Data paper, Undefined. The document type was followed by 80(0.15%), 68(0.12%), 2(0.00%), and 2(0.00%). The highest document type score in the Article and Review was 84.56%, with the remaining document type scoring 15.44%.

Top 10 most productive authors Brain Tumor

Table 5 top 10 most productive authors Brain Tumor

S.No	Author	Country	Publications	%	Citations	%	CPP	H-Index	RCI
1	Weller, M.	United States	218	14.23	12099	9.60	55.50	56	0.67
2	Taylor, M.D.	China	166	10.84	16635	13.20	100.21	56	1.22
3	Duffau, H.	Germany	154	10.05	3898	3.09	25.31	36	0.31
4	Wen, P.Y.	India	151	9.86	9341	7.41	61.86	50	0.75
5	Jiang, T.	Italy	148	9.66	5542	4.40	37.45	42	0.46
6	Bouffet, E.	Japan	143	9.33	7398	5.87	51.73	39	0.63
7	Jones, D.T.W.	United Kingdom	143	9.33	19688	15.63	137.68	61	1.67
8	Wick, W.	France	141	9.20	14104	11.20	100.03	52	1.22
9	Pfister, S.M.	Canada	137	8.94	20864	16.56	152.29	67	1.85
10	Kool, M.	South Korea	131	8.55	16411	13.03	125.27	50	1.52
	Total		1532	100.00	125980	100.00			

Table 5 shows the top ten most productive authors in brain tumor research from 2012 to 2021. Weller, M. from the United States contributed the most publications (218(14.23%), followed by Taylor, M.D. from China with 166(10.84%) and Duffau, H. from Germany with 154(10.05%). Wick, W. France has the fewest research publications (141(9.20%).

The most citations are found in 20864 (16.56%) research publications, and the H-index is 67, the CPP is 152.29, and the RCI is 1.85. The H-index is 61, the CPP is 137.68, and the RCI is 1.67, followed by 19688

(15363%) research publications. Duffau, H., and Germany have the fewest citations with 3898 (3.09%) research publications, the H-index is 36, the CPP is 25.31, and the RCI is 0.31.

Distribution of Publications on Brain Tumor Research by Subject

Table 6 shows the distribution of publications on brain tumor Research by Subject

S.No	Subject	Publications	%
1	Agricultural and Biological Sciences	710	2.62
2	Arts and Humanities	128	0.47
3	Biochemistry, Genetics and Molecular Biology	18451	68.21
4	Business, Management and Accounting	99	0.37
5	Chemical Engineering	1299	4.80
6	Chemistry	1765	6.52
7	Computer Science	4186	15.48
8	Decision Sciences	326	1.21
9	Dentistry	61	0.23
10	Earth and Planetary Sciences	25	0.09
	Total	27050	100.00

Table 6 lists the top ten subjects of brain tumor research during the time period under consideration. According to the analysis, the majority of the articles on brain tumors for the study period were published in Biochemistry, Genetics, and Molecular Biology (18451(68.21%)), Computer Science (4186(15.48%), and Chemistry (1765(6.52%). Earth and Planetary Sciences have the fewest journal publications (25(0.09%) research publications.

Authorship Pattern in Brain Tumor

Table 7 Authorship Pattern in Brain Tumor

	Authorship pattern						
Years	**1**	**2**	**3**	**4**	**5**	**>5**	**total**
2012	357	449	432	400	364	1437	3439
2013	308	416	380	407	380	1517	3408
2014	307	446	460	444	419	1839	3915
2015	255	503	486	452	430	2110	4236
2016	289	524	510	532	494	2404	4753
2017	308	539	576	594	627	2947	5591
2018	347	620	636	718	702	3532	6555
2019	331	655	751	741	761	3886	7125
2020	290	671	766	824	806	4152	7509
2021	298	729	905	971	876	4568	8347
total	3090	5552	5902	6083	5859	28392	54878

Table 7 identifies the year-by-year authorship pattern in the field of brain tumor research across a ten-year investigation period. According to the study, 3090 studies are contributed by single authors, while the rest 51788 studies are contributed by multi-authors. A maximum of 5552 articles are produced by two authors, in addition to 5905 papers provided by three authors, 6083 articles provided by four authors, and 5859 articles provided by five authors. Over the course of the 10-year investigation, more than five authors submitted 28392 papers.

Degree of Collaboration in Brain Tumor

Table 8 Degree of Collaboration in Brain Tumor

years	Single author publications	Multi authors publications	Total authors publications	Degree of collaborations DC = Nm/(Nm+Ns)
2012	357	3082	3439	0.90
2013	308	3100	3408	0.91
2014	307	3608	3915	0.92
2015	255	3981	4236	0.94
2016	289	4464	4753	0.94
2017	308	5283	5591	0.94
2018	347	6208	6555	0.95
2019	331	6794	7125	0.95
2020	290	7219	7509	0.96
2021	298	8049	8347	0.96
total	3090	51788	54878	

Table 8 depicts the level of collaboration in brain tumor research publications over a ten-year period. According to the findings of this study, the degree of collaboration is between 0.90 in 2012 and 0.96 in 2021. The average level of the average of collaboration is 0.94. According to this study, the majority of brain tumor papers are contributed by collaborative authors.

Co-Authorship Index in Brain Tumor

Table 9 Co-Authorship Index in Brain Tumor

5 year Block	Single	CAI	Two	CAI	Three	CAI	More than three	CAI	Total
2012-2016	1516	136.32	2338	117.00	2268	106.77	13629	93.89	19751
2017-2021	1574	79.58	3214	90.44	3634	96.19	26704	103.44	35127
Total	3090		5552		5902		40333		54878

Table 8 displays the Co-Authorship Index values for brain tumor research articles determined over a 10-year research period by block year period. CAI for single, two, and three authorship contributions are dropping from the first to the second block year, according to the research. Simultaneously, CAI for more than three authors increases from the first block year (93.89) to the second block year (93.89). (103.44).

CC, CI, and MCC in Brain Tumor Research Publication

Table 10 CC, CI, and MCC in Brain Tumor Research Publication

authorship pattern										
Years	**1**	**2**	**3**	**4**	**5**	**6**	**CC**	**CI**	**MCC**	**total**
2012	357	449	432	400	364	1437	0.67	4.24	4.24	3439
2013	308	416	380	407	380	1517	0.69	4.38	4.38	3408
2014	307	446	460	444	419	1839	0.70	4.47	4.47	3915
2015	255	503	486	452	430	2110	0.71	4.56	4.57	4236
2016	289	524	510	532	494	2404	0.72	4.61	4.61	4753
2017	308	539	576	594	627	2947	0.73	4.71	4.71	5591
2018	347	620	636	718	702	3532	0.73	4.74	4.74	6555
2019	331	655	751	741	761	3886	0.73	4.77	4.77	7125
2020	290	671	766	824	806	4152	0.74	4.82	4.82	7509
2021	298	729	905	971	876	4568	0.74	4.81	4.81	8347
total	3090	5552	5902	6083	5859	28392				54878

CC-Collaborative coefficient, CI-Collaboration index, CC-Modified collaboration coefficient

As shown in Table 10, the collaborative coefficient is calculated and presented for brain tumor research publications over a ten-year period. According to the table, the highest collaboration coefficient is 0.74 in 2020 and 2021, the lowest CC is 0.67 in 2012, and the average CC is 0.72. The maximum CI observed in Table 10 is 4.82 in the year 2020, a minimum of 4.24 in the year 2012, and the average CI is 4.60. The Modified Collaboration Coefficient (MCC) observed in Table 10 has a maximum of 4.82 in 2020, a minimum of 4.24 in 2012, and an average MCC of 4.60.

Most productive Institutions in Brain Tumor research publications

Table 11 Most productive Institutions on Brain Tumor research publications

S.No	Institutions	Publications	%	Citations	%	CPP	H-Index	RCI
1	Harvard Medical School	1450	15.89	75990	17.67	52.41	113	1.11
2	University of Texas MD Anderson Cancer Center	1074	11.77	46092	10.72	42.92	101	0.91
3	German Cancer Research Center	931	10.20	60313	14.02	64.78	106	1.37
4	University of California, San Francisco	906	9.93	52630	12.24	58.09	101	1.23
5	Massachusetts General Hospital	892	9.77	49209	11.44	55.17	89	1.17
6	Inserm	854	9.36	24685	5.74	28.91	68	0.61
7	University of Toronto	850	9.31	36406	8.46	42.83	88	0.91
8	Brigham and Women's Hospital	758	8.31	31913	7.42	42.10	90	0.89
9	Capital Medical University	710	7.78	13882	3.23	19.55	56	0.41
10	Dana-Farber Cancer Institute	701	7.68	38993	9.07	55.62	93	1.18
	Total	9126	100.00	430113	100.00			

Table 11 lists the top ten brain tumor research institutions during the study period. According to the analysis, Harvard Medical School published the most articles on brain tumors during the study period, with 1450 (15.89%), the University of Texas MD Anderson Cancer Center published 1074 (11.77%), and the German Cancer Research Center published 931 (10.20%). Dana-Farber Cancer Institute has the fewest journal publications (7.68%).

The most citations are found in 75990 (17.67%) research publications, the H-index is 113, the CPP is 52.41, and the RCI is 1.11. The H-index is 106, the CPP is 64.78, and the RCI is 1.37, followed by 60313 (14.02%) research publications. Capital Medical University has the fewest citations, with 13882(3.23%) research publications. the H-index is 56, the CPP is 19.55, and the RCI is 0.41.

Journal-wise distribution of Brain Tumor research publications

Table 12 Journal-wise distribution of Brain Tumor research publications

S.No	Journals	Publications	%	Citations	%	CPP	H-Index	RCI
1	Journal Of Neuro-Oncology	1660	20.61	32851	18.60	19.79	65	0.90
2	World Neurosurgery	1359	16.87	10449	5.92	7.69	34	0.35
3	Neuro-Oncology	1055	13.10	47488	26.89	45.01	97	2.05
4	Plos One	751	9.32	19743	11.18	26.29	64	1.20
5	Scientific Reports	668	8.29	12738	7.21	19.07	50	0.87
6	Oncotarget	649	8.06	20359	11.53	31.37	62	1.43
7	Journal Of Neurosurgery	538	6.68	13898	7.87	25.83	56	1.18
8	Lecture Notes in Computer Science, Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics	507	6.29	7069	4.00	13.94	42	0.64
9	Journal Of Clinical Neuroscience	452	5.61	4847	2.74	10.72	34	0.49
10	International Journal Of Molecular Sciences	416	5.16	7186	4.07	17.27	39	0.79
	Total	8055	100.00	176628	100.00			

Table 12 highlights the top 10 journals for brain tumor research over this investigation time. According to the analysis, most of the articles on brain tumors for the study period were published in the Journal of Neuro-Oncology (1660(20.61%), World Neurosurgery (1359(16.87%), and Neuro-Oncology (1055(13.10%). International Journal of Molecular Sciences 416 (5.16%) has the fewest journal publications.

47488 (26.89%) research publications have received the most citations, and the H-index is 97, the CPP is 45.01, and the RCI is 2.05. The H-index is 65, the CPP is 19.79, and the RCI is 0.90, with 32851 (16.60%) research publications following. The lowest number of citations is 4847 (2.47%), the H-index is 34, the CPP is 10.72, and the RCI is 0.49.

Country-wise distribution of Brain Tumor

Table 13 Country-wise distribution of Brain Tumor

S.No	Country	Publications	%	Citations	%	CPP	H-Index	RCI
1	United States	17921	35.81	529202	42.09	29.53	237	1.18
2	China	8280	16.55	168443	13.40	20.34	134	0.81
3	Germany	4516	9.02	150648	11.98	33.36	150	1.33
4	India	3496	6.99	37532	2.98	10.74	74	0.43
5	Italy	3131	6.26	78834	6.27	25.18	104	1.00
6	Japan	3049	6.09	53165	4.23	17.44	86	0.69
7	United Kingdom	2944	5.88	10158	0.81	3.45	132	0.14
8	France	2618	5.23	91063	7.24	34.78	111	1.38
9	Canada	2549	5.09	102010	8.11	40.02	134	1.59
10	South Korea	1540	3.08	36325	2.89	23.59	78	0.94
	Total	50044	100.00	1257380	100.00			
	Other Country - 150	22135						

Table 13 depicts the geographical distribution of the top 10 countries of publications 50044 publications, out of 150 countries 22135 publications, The United States provided the most articles, accounting for more than 17921(35.81%) of total publishing, next to China (8280(16.55%) and Germany 4516(9.02%), accounting for more than 61.38% of global papers in the field of brain tumor. Furthermore, India (3496(6.99%), Italy 3131(6.26%), Japan (3049(6.09%), United Kingdom 2944(5.88%), France 2618(5.23%), Canada 2549(5.09%), and South Korea 1540(3.08%) are observed.

529202 (42.09%) research publications have received the most citations, the H-index is 237, the CPP is 29.53, and the RCI is 1.18. The H-index is 134, the CPP is 20.34, and the RCI is 0.81, followed by 168443 (13.40%) research publications. The research publications with the fewest citations have 10158 (0.81%), the H-index is 132, the CPP is 23.45, and the RCI is 0.14.

Funding Agencies of Brain Tumor Research Publications

Table 15 Funding Agencies of Brain Tumor Research Publications

S.No	Funding	Publications	%
1	National Cancer Institute	4368	26.63
2	National Institutes of Health	3737	22.78
3	National Natural Science Foundation of China	2934	17.89
4	National Institute of Neurological Disorders and Stroke	1676	10.22
5	Japan Society for the Promotion of Science	1037	6.32
6	National Institute of General Medical Sciences	591	3.60
7	National Center for Advancing Translational Sciences	551	3.36
8	National Institute of Biomedical Imaging and Bioengineering	547	3.33
9	Deutsche Forschungsgemeinschaft	496	3.02
10	National Research Foundation of Korea	467	2.85
	Total	16404	100.00

The involvement of the largest and most productive funding agency in the study of brain tumors is seen in Table 15. It is observed that brain tumor has contributed the highest number of brain tumor research publications in the National Cancer Institute, with 4368(26.63%) research publications, followed by the National Institutes of Health with 3737(22.78%) research publications, and the National Natural Science Foundation of China with 2934(17.89%) research publications. National Research Foundation of Korea had the fewest research publications (467 (2.85%). During the ten-year study period, 16404 (100%) research publications were published.

Top 10 Most productive keywords in Brain Tumor Research publications

Table 16 top 10 most productive keywords in Brain Tumor Research publications

S.No	Keyword	Publications	%
1	Human	45297	15.88
2	Brain Tumor	39661	13.90
3	Humans	38521	13.50
4	Article	32084	11.25
5	Brain Neoplasms	31274	10.96
6	Female	22535	7.90
7	Male	22204	7.78
8	Adult	18724	6.56
9	Priority Journal	17596	6.17
10	Pathology	17366	6.09
	Total	285262	100.00

The significance of a particularly common term in the study of brain tumors is shown in Table 16. With 45297 (15.88%), the brain tumor has generated the most number of human research articles. Followed by Brain Tumor with 39661(13.90%), and Humans with 38521(13.50%). Pathology had the fewest research publications (17366(6.09%). During the ten-year study period, 285262 research publications (100%) were published.

Highly cited paper in Brain Tumor Research Publication

Table 17 highly cited paper in Brain Tumor Research Publication

S.No	Titles	Citations	Document Type
1	Louis, D.N., et.al (2016) The 2016 World Health Organization Classification of Tumors of the Central Nervous System: a summary, Acta Neuropathologica, 131(6): 803-820.	9059	Review
2	Vogelstein, B., et.al (2013) Cancer genome landscapes, Science, 340(6127): 1546-1558.	5099	Review
3	Le, D.T., et.al (2017) Mismatch repair deficiency predicts response of solid tumors to PD-1 blockade, Science, 357(6349):409-413.	3603	Article
4	Menze, B.H., et.al (2015) The Multimodal Brain Tumor Image Segmentation Benchmark (BRATS), IEEE Transactions on Medical Imaging, 34(10):1993-2024.	2617	Article
5	Pearce, M.S., et.al (2012) Radiation exposure from CT scans in childhood and subsequent risk of leukemia and brain tumors: A retrospective cohort study, The Lancet, 380(9840):499-505.	2513	Article
6	Gorrini, C., et.al (2013) Modulation of oxidative stress as an anticancer strategy, Nature Reviews Drug Discovery, 12(12):931-947.	2163	Review
7	Olesen, J. (2018) Headache Classification Committee of the International Headache Society (IHS) The International Classification of Headache Disorders, 3rd edition, Cephalalgia, 38(1): 1-211.	2130	Editorial
8	Allemani, C., et.al (2018) Global surveillance of trends in cancer survival 2000–14 (CONCORD-3): analysis of individual records for 37 513 025 patients diagnosed with one of 18 cancers from 322 population-based registries in 71 countries, The Lancet, 391(10125): 1023-1075.	1989	Article
9	Kamnitsas, K., et.al (2017) Efficient multi-scale 3D CNN with fully connected CRF for accurate brain lesion segmentation, Medical Image Analysis, 36, 61-78.	1900	Article
10	Havaei, M., et.al (2017) Brain tumor segmentation with Deep Neural Networks, Medical Image Analysis, 35, 18-31.	1805	Article

Louis, D.N., et al. (2016) The 2016 World Health Organization Classification of Tumors of the Central Nervous System: a summary, Acta Neuropathologica, 131(6): 803-820. Citations are 9059 and the review's document type. Vogelstein, B., and colleagues (2013) Cancer genome landscapes, Science, 340(6127): 1546-1558. Citations are 5099 and review-type documents. And Le, D.T., et al. (2017), Mismatch repair deficiency predicts PD-1 blockade response in solid tumors, Science, 357(6349):409-413. Citations are 3603 and the article's document type. Three reviews, one editorial, and six articles are among the top ten most cited papers.

Major Findings

- The study examined various Scientometrics parameters in Brain Tumor research during the period 2012-2021. The annual growth rate of brain tumor research papers is increasing; in 2021, a total of 8347 (15.21%) research papers were released, followed in 2020 by 7509 (13.68%) articles. and the third-highest publications year was 2019 with a total of 7125(12.98%) research papers.
- The source type distribution of Brain Tumor research output in which a maximum of 50128(91.34%) of research papers were published in Journals
- For the provided study period, the relative growth rate of a paper increased over time from 0.69 in 2013 to 0.16 in 2021. The time it takes to publish an item doubles progressively growing from 1.01 in 2013 to 4.20 in 2021.
- The document-type distribution of brain tumor research output for the period under study. It is clear from the analysis that the share of articles stood at 1st position and occupies 39158(71.35%) of total publications
- During the authors a maximum of 218(14.23%) research publications were contributed by Weller, M., the United States, followed by Taylor, M.D., China with 166(10.84%) contributions, Duffau, H. Germany with 154(10.05%) research publications
- The analysis of subjects that a majority of the articles on brain tumors for the study period is in Biochemistry, Genetics, and Molecular Biology with 18451(68.21%) publications, Computer Science with 4186(15.48%) publications, Chemistry with 1765(6.52%) publications
- During the study, 3090 research publications were submitted by single authors, with a median degree of collaboration of 0.94. The average CC is 0.72, the average CI is 4.60, and the average MCC is 4.60.
- The co-author index for single, two, and three authorship contributions is decreasing trend from 1st block year to 2nd block year. At the same time, CAI is increasing trend for more than three authors from 1st block year (93.89) to 2nd year block year (103.44).
- The analysis of Institutions that a majority of the articles on brain tumors for the study period is in the Harvard Medical School with 1450(15.89%) publications, and the analysis journals that a majority of the articles on brain tumors for the study period is in the Journal of Neuro-Oncology with 1660(20.61%) publications,
- During Country the United States with the maximum 17921(35.81%) research publications, followed by China with 8280(16.55%) and, the Germany 4516(9.02%),
- During the funding agency the brain tumor has contributed the highest number of brain tumors with 4368(26.63%) research publications in the National Cancer Institute, and keyword has contributed the highest number of human with 45297(15.88%) research publications,
- During the highly cited paper is Louis, D.N., et.al (2016) The 2016 World Health Organization Classification of Tumors of the Central Nervous System: a summary, Acta Neuropathologica, 131(6): 803-820. Citations are 9059 and the document type of the review.

Conclusion

Scientometrics has applications in practice for evaluating library operations and surveys using statistical methods to enable quantitative analysis. It can be used to investigate and quantify the consumption patterns of distinct types of literature on one or more subjects. Globally, it is estimated that the majority of people are diagnosed with brain tumors. Because brain tumors threaten human life, accurate detection has become critical in medical science. As a result, researchers from computer science, medicine, and mathematics have combined their knowledge and efforts to better diagnose the disease and treat it effectively. The scope of future research in this area is that many equations and formulas encourage scientists to test, and researchers can use data from various databases. Also, it may be beneficial for doctors who are currently studying brain tumors.

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