



EVALUATION OF PUBLICATIONS ON PINEAL TUMOR FROM A BIBLIOMETRIC PERSPECTIVE

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Abstract: There are still many unknowns about the classification, diagnosis, and treatment of pineal tumors. The aim of this study was to review the accumulated knowledge of pineal tumors to guide future research. Web of Science (WoS) Core Collection was used to access the articles, and the Vosviewer package program was used for visualizations. The results showed that, between 1970 and December 2022, the WoS database indexed 1103 publications and 668 articles on pineal tumors. 92,365% of the articles were published in journals within the scope of the Science Citation Index Expanded. 798 institutions and 2,841 authors contributed to the pineal tumors literature. The most important contributions to the literature on pineal tumors were made by institutions in France and the United States. The majority of the articles were from the USA (n=190, 28.443%), Japan (n=111, 16.617%), and France (n=62, 9.281%). The number of articles were irregular in each per year. However, more citations have been made, especially since 2010. In this study, the studies on pineal tumors in the world were examined and the main underlied issues were tried to be emphasized. In addition, it has been observed that the scientific and industrial sectors should cooperate in order to increase the allocated resources for multidisciplinary researches.

Keywords: Bibliometric analysis, Citations, Pineal tumor

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1. Introduction

The pineal gland is a tiny, pinecone-shaped endocrine gland that helps vertebrates regulate their metabolic rhythms. Melatonin, a versatile endogenous indoleamine, is known as the pineal gland's main output. The pineal gland may be crucial for maintaining optimal function of vertebrates, according to mounted research (Favero et al., 2021). The pineal gland is a neurosecretory organ located anatomically at the midpoint of the brain, owning tissue specific cells, and surrounded by eloquent brain structures and veins of the brainstem. Thus pineal gland neurosurgeries are unique due to those specificities (Turhan, 2021).

The pineal gland could be the origin of a range of tumor development (Louis et al., 2007). Pineal area tumors account for approximately 3-11% of brain tumors in children, but less than 1% in adults (Schipmann et al., 2017; Favero et al., 2021). The overall incidence of pineal neoplasms might be varying depending on age, sex, and ethnicity (Iorio-Morin et al., 2017).

The majority of those tumors are glial tumors, germ cell tumors, and pineal parenchymal tumors (PPT) (Choque-Velasquez et al., 2020). These heterogeneous tumors are PPT and papillary tumor of the epiphyseal region (PTPR). They could be graded at different histopathological levels (Louis et al., 2007). PPT are an uncommon form of central nervous system neoplasms that includes a wide

range of entities with different histologic characteristics and clinical manifestations (Liu et al., 2021). According to the last 2021 WHO Classification of Tumors of the Central Nervous System pineal tumors are classified as; pineocytoma, PPT of intermediate differentiation, pineoblastoma, papillary tumor of the pineal region, desmoplastic myxoid tumor of the pineal region, and SMARCB1-mutant (Louis et al., 2021). The incidence of pineal gland tumors has been previously reported as 0.1-0.3 100,000 / per year according to different authors (Ueyama et al., 1998; Turhan, 2021).

The growth and development of pineal gland tumors are significantly influenced by the molecular profiles and tumor microenvironment. As a result, they seem to be crucial elements of the clinical outcomes and might have change the effectiveness of various treatment approaches (Choque-Velasquez et al., 2020). There is still lacking about the gold standard adjuvant therapy for PPTIDs. Moreover, children with PB succumb, despite rigorous cytotoxic chemotherapy and craniospinal radiotherapy, which is not practical in young children. The common surgery method for Pineocytoma is resection (Choque-Velasquez et al., 2020; Xin et al., 2021; Shepard et al., 2022). Pineal tumor manner is still a subject of much debate, and the standards of histological grading for PPTID, PTPR, and Desmoplastic myxoid tumor, SMARCB1-mutant have not yet been established.



Importantly, diagnoses of those are influenced by molecular investigations (Louis et al., 2021). There is still lacking about classification, diagnosis and treatment of this subject (Louis et al., 2021; Turhan, 2021). In this study, it was aimed to review the scientific output of pineal tumors and to guide future studies.

2. Materials and Methods

A basic search of the Web of Science (WoS) database in December 2022 using the target keywords ""pinealoma"[MeSH Terms] OR Pineal tumor[Text Word] OR Pineal gland tumor OR pineal parenchymal tumor OR pinealocytoma" without regard to publication dates.

The search strategy was given as follows;

- i. Title: ""pinealoma"[MeSH Terms] OR Pineal tumor[Text Word] OR Pineal gland tumor OR pineal parenchymal tumor OR pinealocytoma"
- ii. Selected document type: Research article
- iii. Timespan: 1970–December, 2022.
- iv. Selected indexes: Web of Science Core Collection Editions: All

The citation analysis and co-authorship analysis were performed by VosViewer 1.6.18 (<https://app.vosviewer.com/>). VOSviewer is a computer program that could be used to develop and visualize bibliometric networks. These networks could be composed via citation, bibliographic coupling, co-citation, or co-authorship relationships, and might include journals, researchers, or individual articles. Additionally, VOSviewer has text mining capabilities that may be used to build and display co-occurrence networks of

significant phrases taken from a corpus of scientific literature (<https://www.vosviewer.com/>).

3. Results

The findings revealed that 1103 publications and 668 articles on pineal tumors were indexed in the Wos database between 1970 and December, 2022. 92.365% of the articles were published in Science Citation Index Expanded (SCI-EXPANDED) journals. English was the mostly preferred language of the articles with amount of 95.210%. German (1.647%), French (1.198%), Spanish (0.898%), Japanese (0.449%), Russian (0.449%) and Czech (0.449%) were the other preferred languages. 2,841 authors and 798 institutions contributed the pineal tumor literature. The institutions from France (Hospices Civils de Lyon:35 articles; Udice French Research Universities:26 articles; Institut national de la santé et de la recherche médicale:22 articles) and the United States of America (Harvard University: 32 articles) made the biggest contribution on pineal tumor literature. The majority of the articles were from the USA (n=190, 28.443%), Japan (n=111, 16.617%), France (n=62, 9.281%), Germany (n=50, 7.485%), Italy (n=41, 6.138%), England (n=33, 4.940%), China (n=31, 4.641%), India (n=24, 3.593%), South Korea (n=21, 3.144%).The number of articles published per year were irregular. However, the number of citations were increased especially since 2010. 2011 was the most articles published and cited year of all. 38 articles published in 2011 and cited about 803 times (Figure 1 and 2).

Articles by years

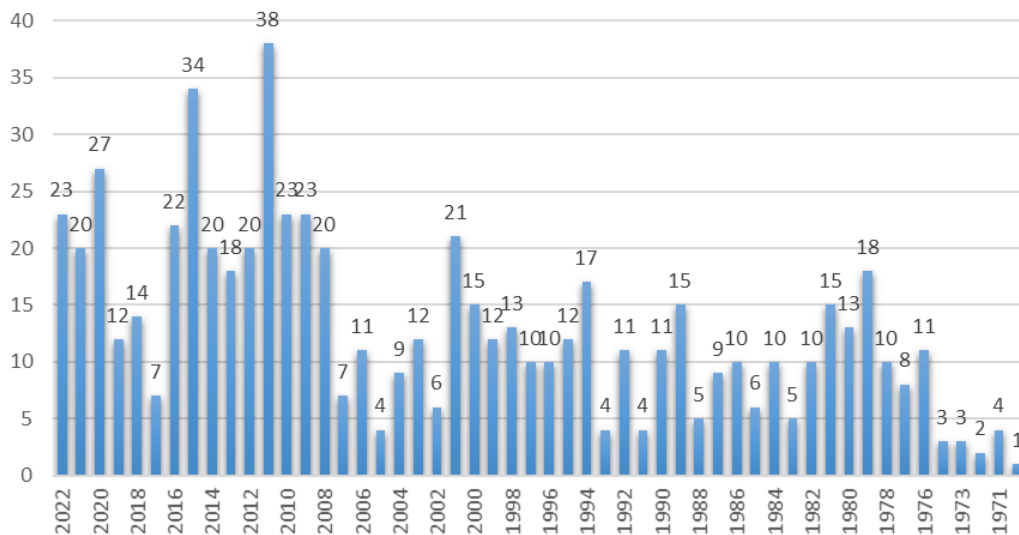


Figure 1. Number of publications by years between 1971-2022.

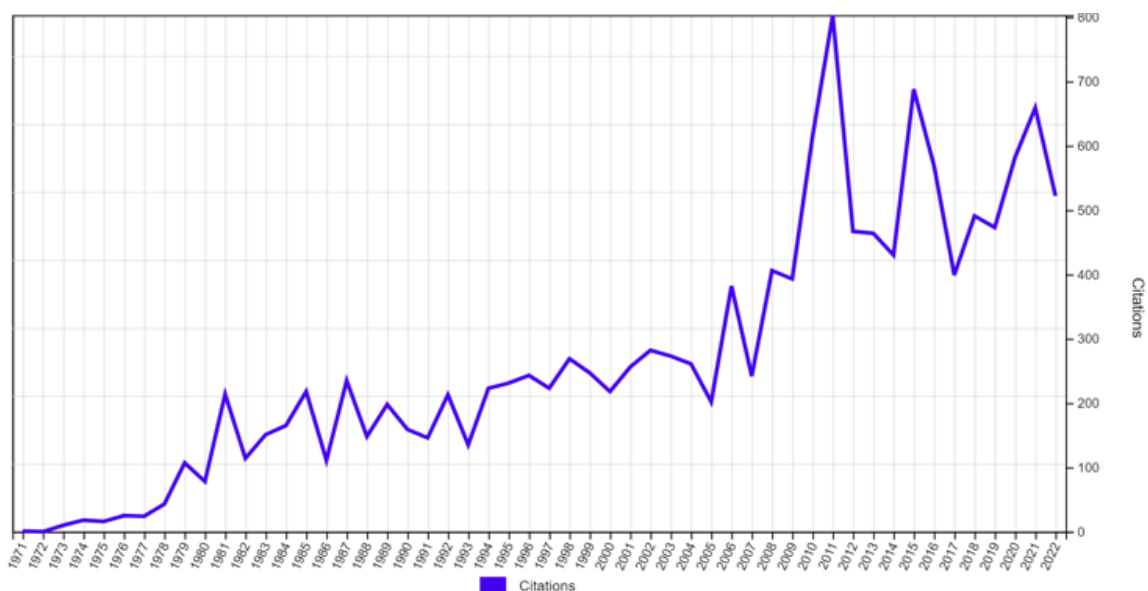


Figure 2. Number of citations by years between 1971-2022.

The articles about pineal tumors were mostly published in the 'Childs Nervous System' journal (n=32, 4.79%), Journal of Neurosurgery (n=28, 4.192%), Journal of Neuro Oncology (n=27, 4.042%). Table 1 summarizes the mostly published journals about pineal tumors.

The articles were mostly funded by United States Department of Health Human Services (n=21, 3.144%). Figure 3 summarizes the main funding agencies of publications about pineal tumors.

The publications cited 14,046 times (the citation number per publication was 21.03). The publication with the highest citation number released in 1998 (Edwards et al., 1998). This article cited 207 times.

The density visualization map made with Vosviewer belongs to the most preferred keywords in the articles represented in Figure 4.

Figure 5 summarizes the bibliographic coupling between the mostly publishing countries. The same colors show the connections with each other. Bold lines denote more connections.

Figure 6 summarizes the co-authorship analysis according to years between countries. The colors show links between the publications published between 1980 and 2020.

Table 1. Mostly publishing journals on pineal tumors.

Journal	n	%
Childs Nervous System	32	4.790
Journal of Neurosurgery	28	4.192
Journal of Neuro Oncology	27	4.042
Acta Neurochirurgica	25	3.743
World Neurosurgery	20	2.994
Neurochirurgie	19	2.844
Neurosurgery	16	2.395
Cancer	15	2.246
Surgical Neurology	15	2.246
Brain Tumor Pathology	14	2.096
Neuropathology	12	1.796
Journal of Clinical Neuroscience	10	1.497
Acta Neuropathologica	9	1.347
Journal of Neuropathology and Experimental Neurology	9	1.347
Neuroradiology	9	1.347
British Journal of Neurosurgery	8	1.198
Radiology	8	1.198
American Journal of Roentgenology	7	1.048
Clinical Neurology and Neurosurgery	7	1.048
Journal of Neurosurgery Pediatrics	7	1.048
Neurosurgical Review	7	1.048
American Journal of Neuroradiology	6	0.898
American Journal of Surgical Pathology	6	0.898
Brain Pathology	6	0.898
Childs Brain	6	0.898

*Showing 25 out of 255 entries



Figure 3. The main funding agencies about pineal tumors.

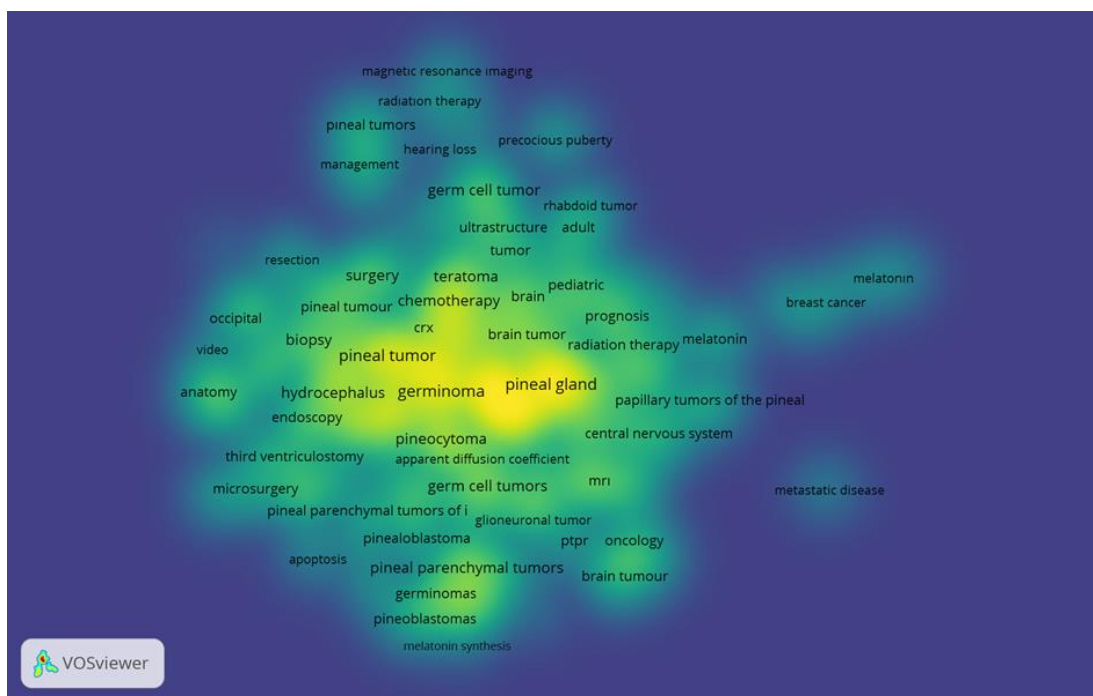


Figure 4. Density visualisation of the keywords with minimum 3 occurrences.

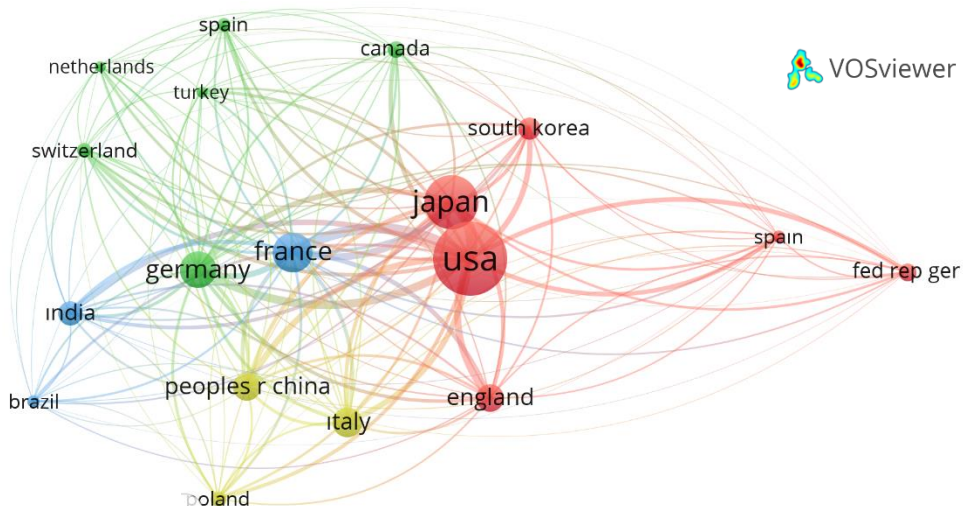


Figure 5. Bibliographic coupling between the countries.

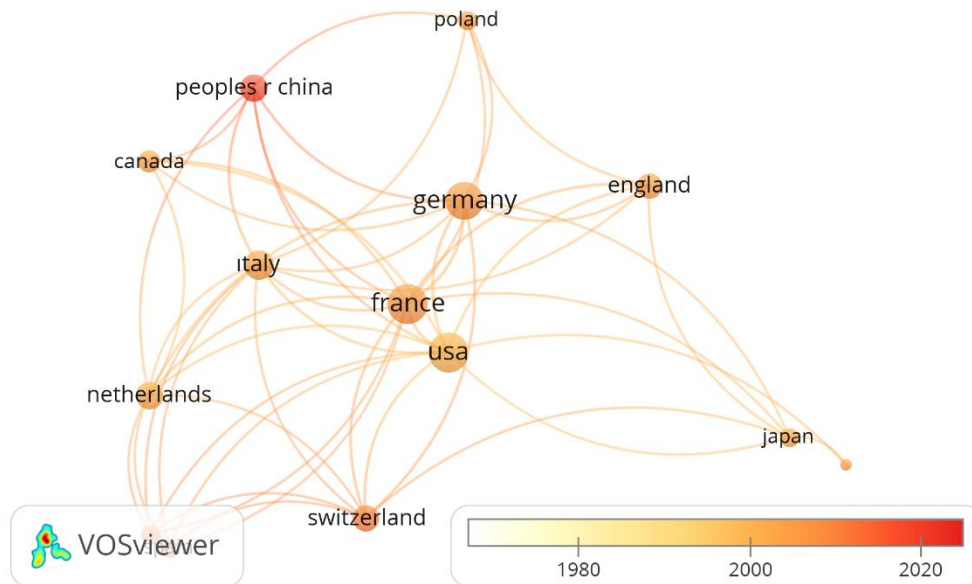


Figure 6. Co authorship analysis according to years between countries.

4. Discussion

Bibliometric analyses are frequently utilized to evaluate the scholarly influence of any scientific publication as well as in the field of neurosurgery research (Blount, 2018; Burak Atci et al., 2019; Emery, 2019; Oravec et al., 2019; Ota et al., 2020; Ozbek et al., 2022). To the best of our knowledge, our study is the first bibliometric research about pineal tumors. In this study, it was aimed to review the scientific output of pineal tumors and to guide future studies.

Pineal neoplasms are unique tumors that vary as morphological, histological, and radiological characteristics, which requires a customized approach for diagnosis and treatment. Pineal tumors are not only uncommon but also cause delayed diagnoses. To aid in the differentiation of pineal tumors and hence assist accurate primary diagnoses and suitable therapeutic approaches, it is essential to extend modern imaging techniques together with clinical and laboratory expertise (Favero et al., 2021). According to the results of the current study, pineal tumor subtypes were among the most used keywords.

Pineal tumors are divided into different categories. Louis and colleagues published a new WHO classification of central nervous system tumors in 2021 (Louis et al., 2021). It is estimated that up to 50% of pineal tumors in Europe, the USA, and Japan are germinomas, making them the most prevalent type (Nomura, 2001; Villano et al., 2008; Carr et al., 2019). According to the findings of the current study, the institutions from France (Hospices Civils de Lyon:35 articles; Udice French Research Universities:26 articles; Institut national de la santé et de la recherche médicale:22 articles) and the USA (Harvard University: 32 articles) made the biggest contribution on pineal tumor literature. The excess in the number of publications in France compared to other countries may be related to the prevalence of the disease in Europe.

Pineal tumors can cause non-specific signs and symptoms, but they typically result in compressive hypothalamic syndromes like diabetes insipidus and growth disorders, or syndromes of mass effect like headaches, aqueductal stenosis, and hydrocephalus (Favero et al., 2021). Authors selected the keywords for to distinguish their works. The major components of the topics are once again examined because the bibliometric analysis method makes it simple to find the keywords associated with the study topic (Dindar Demiray et al., 2021; Gürler et al., 2021; Akyüz et al., 2022; Şahin, 2022; Yildirim, et al., 2022). According to the results of the current study, hydrocephalus was among the most used keywords.

Citation analysis indicate the importance of a selected topic. Many bibliometric studies have been published about citation analysis and trend analysis of published literature (Alkan-Çeviker et al., 2021; Ekici et al., 2022; Özlü and Ceylan, 2022; Uyar and Mızrakçı, 2022; Uyar et al., 2022; Kurt, 2023). Due to the steadily rising number of research and citations, it will definitely rank among the most cited papers in the upcoming years.

5. Conclusions

The goal of this analysis was to provide a thorough overview of the significant studies about pineal tumors conducted between 1970 and 2022. Because pineal tumors continue to be a leading cause of cancer-related mortality, brain tumors are gaining more and more interest for scientists and investors. This study could serve as a reference for researchers and funders to determine the more focused areas of pineal tumor researches globally and the main point for to concentrate their efforts. Through this emphasized transdisciplinary research, the scientific and industrial communities must collaborate more in future.

Limitations

The current study was carried out using only the keywords selected in the WoS database and according to Mesh. Therefore, it may not have reflected the entire scientific literature about pineal tumor. However, since there is no other study on this subject, it can provide perspective to the relevant field researchers.

Author Contributions

Percentages of the author(s) contributions is present below. All authors reviewed and approved final version of the manuscript.

%	A.A.
C	100
D	100
S	100
DCP	100
DAI	100
L	100
W	100
CR	100
SR	100
PM	100
FA	100

C= concept, D= design, S= supervision, DCP= data collection and/or processing, DAI= data analysis and/or interpretation, L= literature search, W= writing, CR= critical review, SR= submission and revision, PM= project management, FA= funding acquisition.

Conflict of Interest

The authors declared that there is no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval/Informed Consent

The study complied with the Helsinki Declaration, which was revised in 2013. Ethics committee approval is not required as there is no human or animal research.

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