

Quantitative Analyses of Central Nervous Tumours in Pakistan

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Abstract

Objective: To systematically investigate the status of CNS cancer research in Pakistan.

Methods: Local (PakMedinet) as well as international (PubMed, ISI WoK) were deep-mined using keywords covering various types of malignant CNS tumours. Publications were extracted. An in-house built pipeline of data filtration was applied to obtain relevant studies for further analyses. Data were analyzed using SPSS and/or PRISM. Descriptive statistics including percentages, frequencies were reported.

Results: Of the 305 total researches retrieved initially, a total of 170 fulfilled the inclusion criteria pipeline. Of these 170 publications, 120 were original articles, 27 were review articles, 18 were case reports and 5 were other publication categories. Cumulative citations received by these 170 publications were 1295. The latest article of CNS cancer was published in 2021, suggesting active research in this area from Pakistan. A total of 81 publications were published in international journals while 89 were publications in Pakistani journals. Overall, the highest number of publications were published in the J Pak Med Assoc, followed by J. Ayub Med. Coll. Abbottabad, and then by Pak J Neuro Surg. The highest number of publications was published from the Aga Khan University, Karachi, followed by Ayub Medical College Abbottabad and University of the Punjab, Lahore.

Conclusion: Taken together, this is the first report detailing status of CNS cancer research in Pakistan. While there are a good number of publications available addressing CNS cancers in Pakistan, these tumours must be investigated further as their incidence, prevalence and associated mortality are on rise in the country.

Keywords: Cancer epidemiology; Cancer registry; Cancer research; CNS tumours

Introduction

Central nervous tumors (CNS tumors) are a major contributor to the global cancer-related morbidity and mortality, causing 2.7% of cancer deaths, with a higher incidence in males as compared to females. Remarkably, both incidence and mortality rates of primary tumors are higher in developed countries than in developing countries. Studies, particularly in Western countries, have indicated an increasing occurrence of CNS cancers, most notably among the elderly population. In the USA, the incidence of primary brain tumors is roughly 14.8/100,000/year, while the mortality rate is 5.6/100,000 and 3.7/100,000 for males and females, respectively. Pakistan, a low-income country, is the fifth most populated country in the world. CNS tumors are the 13th most frequently diagnosed tumors in Pakistan, with approximately 3.6% diagnosed as malignant, and they are the 8th most frequent cause of cancer related mortality. Aetiopathogenesis of CNS tumours are not well understood. Main risk factors include genetic factors, ionizing radiation, viral infections, hormonal contraceptives, statins, and alcohol, but no definite conclusions can be taken. There are some data to suggest that CNS tumors may be a consequence of workplace, dietary, and other personal or residential exposures, but studies of cell phone use and electromagnetic fields were inconclusive in tying its use as a cause of CNS tumors. Central nervous system tumors feature more than 100 histological subtypes according to the revised 4th edition of WHO's 2016 classification of CNS neoplasms. Gliomas are the most common primary CNS tumors, responsible for an estimated 24.7% of all primary tumors and 74.6% of all malignant tumors. Other histologically distinct tumors consist of ependymomas, schwannomas, medulloblastomas, CNS lymphomas, and meningiomas. Unfortunately, in Pakistan, the collection of epidemiological data is tricky due to a lack of a centralized cancer registry system and data collection system. In this study, we aimed to systematically investigate the status of CNS

cancer research in Pakistan. We have recently reported the continuous rise of central nervous system tumors in Pakistan. It, therefore, becomes highly relevant to investigate if CNS tumors are being appropriately investigated by Pakistani researchers. While there are considerable research papers being published from the country, the tumor type must be addressed more aggressively due to its high incidence, prevalence, and mortality in Pakistan. Moreover, the study presented herein has, for the first time, quantitatively investigated the status of CNS tumour research in Pakistan. We recommend continuity of such studies so that the status of CNS tumour research may be monitored appropriately to give relevant data to policy makers.

Methods

This observational review was directed at Dow International Medical College of Karachi utilizing a three-part strategy: (1) literature

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Received: 01-Apr-2024, Manuscript No. jpcm-24-134181; **Editor assigned:** 03-Apr-2024, PreQC No. jpcm-24-134181 (PQ); **Reviewed:** 17-Apr-2024, QC No. jpcm-24-134181; **Revised:** 22-Apr-2024, Manuscript No. jpcm-24-134181 (R); **Published:** 30-Apr-2024, DOI: 10.4172/2165-7386.1000632

Citation: Ghania K, Aaqib A, Izat U, Urooba K, Maheen S, Ghousia A, Kinzah I, Fasiha M, Osama MS, Omama H (2024) Quantitative Analyses of Central Nervous Tumours in Pakistan. J Palliat Care Med 14: 632.

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search, (2) screening of publications using a strict inclusion criterion for eligibility, (3) indexation and analysis. All duplicates were prohibited from investigations. CNS tumor in Pakistan was our primary base for discussion on publication in Pakistan. The three part strategy is described below.

Literature Search

This was performed by four authors. In order to extract central nervous tumors related research in Pakistan (PakMedinet) as well as in international (PubMed, ISI WoK) journals, electronic scientific data analysis was explored. To expand this literature search, a major variety of keywords such as: “Astrocytoma and Pakistan”, “Ependymoma and Pakistan”, “Glioblastoma and Pakistan”, “Medulloblastoma and Pakistan” and “Oligodendroma and Pakistan” were entered. Information mining was additionally fortified utilizing the web search GOOGLE and GOOGLE SCHOLAR with a limitation to only show the website pages that were related to central nervous tumors in Pakistan.

Screening Of Publication for Eligibility:

In order to identify publications of interest (to be analyzed in our study), after removal of all duplicate publications, a strict inclusion criterion was specified. Only those publications were included for the study where [1] central nervous tumor was the primary focal point of distribution either straightforwardly, or if there should arise of occurrence in epidemiological studies, gave significant data in regarding to central nervous tumor predicaments in Pakistan, [2] research was attempted in Pakistan or was directly tending to central nervous tumor in Pakistan and additionally, [3] the main author was affiliated to a Pakistani institution. All entries (with and without accessible full texts) satisfying the previously mentioned criteria rules were remembered for the last analyses.

Indexation and Analysis:

Four authors indexed the data in Microsoft Excel individually to avoid any errors. As stated earlier, several data points from each publication were recorded for their: PubMed ID, title, name of journal, year/types of publications, authors name, affiliations, institutes focus on major and minor criteria. Publications which were not filed in PubMed were recalled for non-indexed publications. Ultimately, information entered by the four authors was analyzed further, and any irregularities were explored and looked to produce consensus indexation. Consensus data was then at that point gone into SPSS for additional spellbinding investigations, such as estimation of frequencies and percentages [4].

Results

Initially, a total of 305 studies were retrieved. Of these, 118 entries did not meet the inclusion criteria, and were removed from the study leaving a total of the 187 to be further analyzed. Of the 187 studies, 17 were duplicate entries, so were removed as well. The remaining 170 entries were subjected to final analyses described in this study.

Annual growth of publications

The first and last article on central nervous tumors from Pakistan were published in 1997 and 2021 respectively. Overall, a total of only 10 (5.9%) publications were published before the year 2000. During 2000-2005, a total of 27 publications were published while a total of 21 publications were published during 2006-2010. Within the next five years, 2011-2015, a total of 22 publications were published. Since 2016 to date, a total of 90 publications were published with 2018 being the year with the highest number of published articles (n=26) [5,6]. Since 1997 to date, the average number of publications per year has been low, with only 6.8 publications per year.

Types and research foci of publications

Of the 170 publications that we investigated, a total of 81 (47.6%) publications were indexed in PubMed while 89 (52.4%) were non-indexed publications. Main journals which published central nervous tumors from Pakistan are represented in (Table 1) (journals with more than 1 publication are listed only). Of the 170 publications, 120 (70.6%) were original research publications, 27 (15.9%) were review articles, 18 (10.6%) were case reports and 5 (2.9%) were categorized as others or in an undefined category [7].

Author affiliations and contributing institutions

A total of 55 Pakistani institutions/research centers contributed to the publications that were investigated in this study. Of these, a total of 37 were public/government sector while 17 were private institutions and 1 was semi-private. Interestingly, these 55 institutions were only from 14 cities of Pakistan with Lahore being the main contributor (n=16). These analyses revealed that most cities of Pakistan have no contribution in the field of central nervous tumor. Major contributing institutions towards the publications are listed in (Table 2). Number of citations received Of 170 articles, a total of 35.9% (n=61) articles did not receive any citation [8,9]. The remaining 109 articles were cited minimum one time and therefore summed up to a total of 1295 citations. Of these, 72.8% (n=943) belonged to original articles, 21.6% (n=280) belonged to review articles, 3.6% (n=46) belonged to case reports, and the remaining 2% belonged to all other types of research (Figure 1).

Table 1: Major Journals to Publish CNS Cancer Research from Pakistan.

Name of Journal	Number of Publications	PubMed Indexed	Impact Factor	H-Index
J Pak Med Assoc	33	Yes	0.5	35
J Ayub Med Coll Abbottabad	9	Yes	0.4	31
Pak J Neuro Surg	7	Yes	-	-
Asian Pac J Center	7	Yes	-	-
J Coll Physicians Surgeon	7	Yes	0.4	30
Pak J Med Health	3	No	-	-
Pak J Physiol	2	No	-	-
Pak J Pathol	2	No	-	-
Pak J Med sci	1	Yes	1.08	50
Ann King Edward Med Uni	1	Yes	-	-

Table 2: Major contributing institutions to CNS cancer research in Pakistan.

University/Research Institution	City	n
Aga Khan University Hospital	Karachi	58
Ayub Medical College	Abbottabad	7
University Of the Punjab	Lahore	7
King Edward University	Lahore	6
Dow University Of Health Sciences	Karachi	5

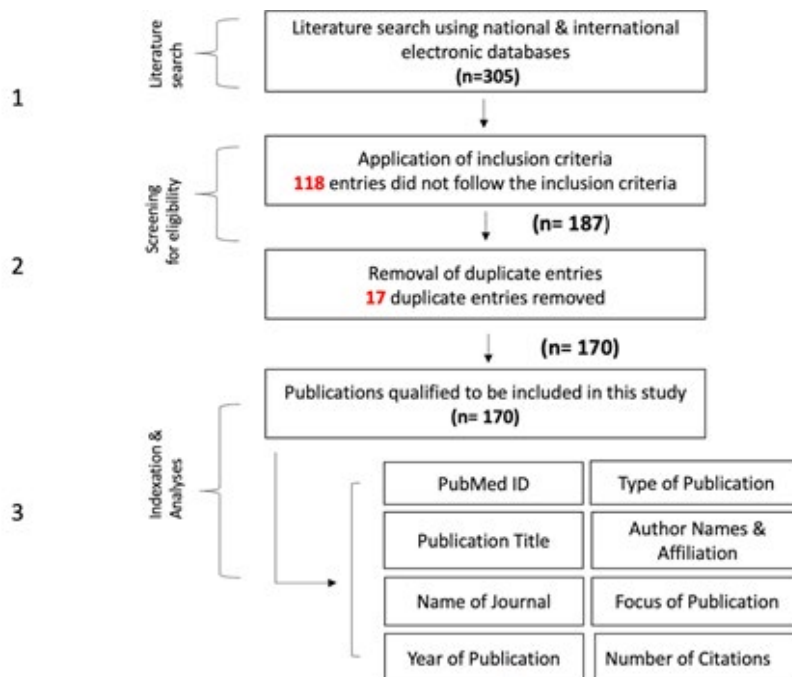


Figure 1: The working algorithm utilized in this study.

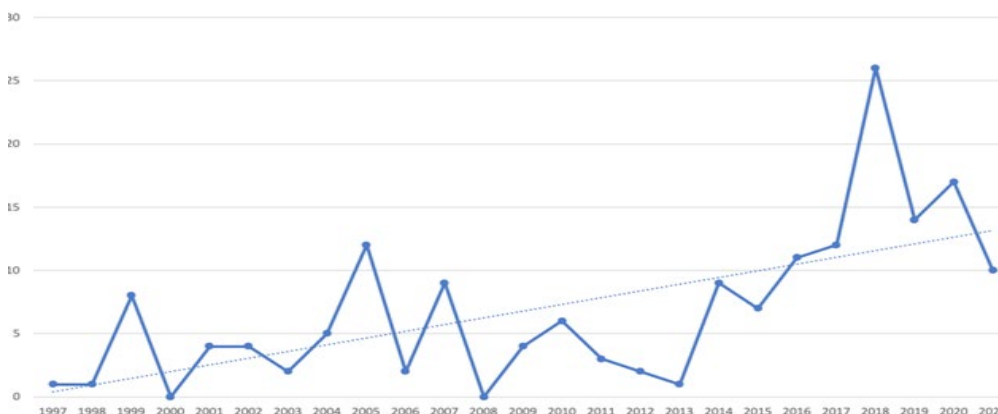


Figure 2: Annual growth of CNS cancer related publications from Pakistan during 1997 to date.

Discussion

There has been substantial increase in CNS tumours in various cities of Pakistan as reported by mainstream cancer epidemiological bodies of the country including the Punjab Cancer Registry, the Dow Cancer Registry⁸ as well as from the Karachi Cancer Registry. It is therefore very important to investigate Pakistani researchers are appropriately investigating these tumours or not. The current study

is first ever systematic approach to investigate existing status of CNS cancer research in Pakistan (Figure 2).

Overall, our data highlight notable increase in CNS cancer research after the year 2000 which is concordant with the increasing incidence and prevalence of these tumours in the country in recent years. While the average number of publications per year is only 6.8 papers/year, it must be noted that there is an upstroke in number of papers published in recent years indicating that Pakistan researchers have taken up

on investigating these tumours as their numbers rise in the country. This is in contrast to status of esophageal and skin cancer research as reported by our groups previously [8, 6]. It is encouraging to note that approximately 70% of the publications were original research articles. This indicates that CNS cancer research is a prime focus of Pakistani researchers and they are aiming to publish more of original data with high novelty quotient [9].

While a good number of Pakistani institutes (a total of 55) participated in CNS cancer research presented in our study, it is important to note that these are representative of only 14 cities of Pakistan. It is therefore highly encouraged that more cities (and institutes) invest their resources towards investigating CNS cancers in Pakistan.

A sign of concern however is the fact that almost 50% of the publications did not publish in impact factor journals and therefore were not rated as high impact papers. Perhaps for this reason, considerable publications did not receive any citation to date indicating their invisibility/importance to relevant readers/researchers. It is important that Pakistani researchers publish their research in indexed journals so that the research is easily visible to international/relevant audience. Taken together, to the best of our knowledge, this is the first study investigating pan-Pakistan status of CNS cancer research. Our findings have not only highlighted current status of CNS cancer research in the country but also provide considerable insights in future directions to address this increasingly prevalent tumour type in Pakistan. We recommend to the policy makers to allocate appropriate

funds and resources to address CNS cancer research in Pakistan.

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