

Clinico-epidemiological Profile of Primary Brain Tumours in North-Eastern Region of India: A Retrospective Single Institution Study

Moumita Paul
Smriti Goswami

Assistant Professor, Department of Radiation Oncology
Department of Radiation Oncology, State Cancer Institute,
Gauhati Medical College, Guwahati-32, India.

Goutham Raj C

Department of Radiation Oncology, State Cancer Institute,
Gauhati Medical College, Guwahati-32, India.

Ghritashee Bora

Department of Radiation Oncology, State Cancer Institute,
Gauhati Medical College, Guwahati-32, India.

Background: Brain tumours are mixed group of neoplasms originating from the intracranial tissues. The two basic types of brain tumours are primary and metastatic tumours. Very little is known about the epidemiology of primary brain tumours in the North-Eastern region of India. We carried out a 5-year retrospective study on the epidemiology of the primary brain tumour treated in our hospital.

Aim: To study the clinico-epidemiological patterns of brain tumour in a tertiary care center in North-Eastern region of India.

Materials and Methods: A retrospective epidemiological approach has been used. The records of patients registered in our hospital from 2017-2022 diagnosed as primary brain tumours have been selected. Data regarding age, sex, site of the tumour, histology, geographical distribution and treatment delivered have been collected.

Results: Out of a total of 100 patients studied, males (68%) outnumbered females (32%) with a male:female ratio of 2.1:1. Frequency of brain tumours was found to be higher in the age group 31-40 years i.e. 23% compared to age groups 21-30 years and 41-50 years which were 18% and 15% respectively. Mean age was 38.23 years with ages ranging from 4 to 73 years. The most common presenting symptom was headache (53%), followed by vomiting (28%). The most common anatomical site was found to be cerebrum (81%), followed by ventricular and periventricular regions (6%). Supratentorial tumours (91%) were predominant over infratentorial tumours (9%). Histologically, the most common variety was found to be Glioblastoma Multiforme (30%) followed by Grade II Astrocytoma (15%) and Grade III Astrocytoma (15%). Patients were mostly seen to be belonging to Lower Assam region (46%). Among all the patients in the study, surgery was done for 90% of patients while 10% did not undergo surgery. 61% of the patients took radiotherapy and chemotherapy, 22% took radiotherapy alone, 7% defaulted treatment (drop outs) and 10% didn't turn up for treatment. All patients received a radiation dose of 54-60 Gy. A total of 41 patients took adjuvant chemotherapy with Temozolomide.

Conclusion: Glioblastoma Multiforme and Astrocytoma are the most common brain tumours in our study. Multimodality management including surgery, radiotherapy and chemotherapy is the cornerstone in the management of brain tumours.

Introduction

Brain tumour, also known as intracranial tumour, is an abnormal mass of tissue arising from the cells within brain. There are more than 150 different types of brain tumours but the two main groups are primary and metastatic. Primary brain tumours (PBTs) are the tumours arising from the

brain tissue or the brain's nearby surroundings. Primary tumours can be classified as benign and malignant depending on the ability to invade the surrounding tissues. Metastatic brain tumors originate elsewhere in the body and then spread to the brain [1]. The GLOBOCAN 2020 data showed that there were 3,08,102 new cases of brain and other central nervous system tumours and 2,51,329 deaths due to the same [2]. According to the Indian Council of Medical Research, Hospital Based Cancer Registry data (2021), brain tumours accounted for 1.6% relative to all other sites of cancer [3].

Common clinical presentations of brain tumours include headache, vomiting to more serious states like motor deficits, seizures, neurocognitive dysfunctions depending on the characteristics of tumour (histology, anatomical location) [4,5].

Molecular alterations involving growth factor overexpression, loss of cell cycle control, dysregulation of apoptosis, genomic instability, invasion, and angiogenesis contribute to tumour development. The study of these elements improves the histopathologic diagnosis and grading of diffuse gliomas. Molecular markers are critical drivers of the prognosis for diffuse gliomas. As a result, molecular marker data are routinely incorporated in clinical trials for stratification and analysis [6]

In the past, the outcome for patients diagnosed with brain tumours was very poor, with typical survival rates of just a few weeks. More sophisticated diagnostic tools, in addition to innovative surgical and radiation approaches, have helped survival rates expand over the years and improved the quality of life for patients following a diagnosis.

Materials and Methods

This is a retrospective study in which the medical records of patients diagnosed with brain tumours in our hospital from 2017-2022 have been studied. Primary tumours of the brain were included, while metastatic tumours and vascular malformations were excluded. The histopathology reports of the patients were collected except for those with brain stem gliomas and thalamic SOLs, where biopsy could not be taken. Data regarding age, sex, site of the tumour, histology, geographical distribution of the patients, and the treatment received were collected and analysed.

Results

Out of a total of 100 patients studied, males (68%) outnumbered females (32%), with a male: female ratio of 2.1:1. Demographic profile of the patients is given in Table 1.

Parameters	Cases (n=100) (%)
Gender	
Male	68
Female	32
Total	100
Age category	
0-10	5
11-20	12
21-30	18
31-40	23
41-50	15
51-60	14
61-70	9
71-80	4
States	



Assam	92
Other North-Eastern (NE) states	
a) Meghalaya	5
b) Nagaland	2
c) Manipur	1
Divisions of Assam	
Upper Assam	19
Central Assam	16
Lower Assam	46
North Assam	9
Barak valley	2
Other NE states	8

Table 1. Demographic Profile of Patients.

The frequency of brain tumours was found to be higher in the age group 31-40 years, i.e., 23 percent, compared to the age groups 21-30 years and 41-50 years, which were 18 percent and 15 percent, respectively. The mean age in our study was 38.23 years, with ages ranging from 4 to 73 years. The most common presenting symptom is headache (53%), followed by vomiting (28%). Other clinical manifestations are hemiparesis/quadruparesis/weakness, convulsions or seizures, gait abnormalities, dizziness, loss of memory, facial deviation, and other symptoms that include (loss of consciousness, sensory loss, pain, speech impairment, abnormal behaviour, weight gain, swallowing difficulty) as mentioned in Table 2.

Parameters	Cases (n=100) (in %)
Histology	
Glioblastoma Multiforme	30
Astrocytoma	
Grade II	15
Grade III	15
Oligodendroglioma	11
Brain Stem Glioma (No histology)	5
Pilocytic Astrocytoma	5
Craniopharyngioma	3
Ependymoma	3
Meningioma	3
Pituitary Tumour	2
Gliosarcoma	2
Pineal tumour	2
Thalamic SOL	2
Acoustic Schwannomma	1
Medulloblastoma	1
Anatomical locations	
Cerebrum	81
Ventricular and Periventricular	6
Cebellar	4
Sellar and Supra sellar	4
Pineal Gland	3
Brainstem	2
Location w.r.t. Tentorium	
Supratentorial	91
Infratentorial	9
Clinical Manifestations	

Headache	53
Vomiting	28
Motor deficits	26
Seizures	19
Dizziness	11
Memory loss	7
Gait abnormalities	6
Facial deviation	5
Tremors	5
Others	17
Treatment	
Radiotherapy	22
Radiation and Chemotherapy	61
Drop out	7
Did not turn for RT	10
Surgery	
Yes	90
No	10

Table 2. Clinical Parameters.

The most common anatomical site was found to be the cerebrum (81%), followed by the ventricular and periventricular regions (6%). Cerebellar; sellar and suprasellar tumours comprised 4% each, pineal gland tumour and brainstem tumour comprised 3% and 2% respectively. Supratentorial tumours (91%) were predominant over infratentorial tumours (9%). Histologically, the most common variety was found to be Glioblastoma multiforme (30%), followed by grade II Astrocytoma (15%), and grade III Astrocytoma (15%). Patients were mostly seen to be belonging to the Lower Assam region (46%), followed by the Upper Assam region (19%), the Central Assam region (16%), the North Assam region (9%), the Barak Valley region (2%), and other North-Eastern states (8%), respectively. Among all the patients in the study, surgery was done for 90%, while 10% did not undergo surgery. 61% took radiotherapy and chemotherapy and 22% took radiotherapy alone, 7% defaulted on treatment (dropouts), and 10% did not turn up for treatment. A total of 41 patients received adjuvant chemotherapy with Temozolomide. All patients received a dose of 54-60 Gy.

Discussion

Primary CNS tumours arise from the brain, cranial nerves, meninges, pituitary, pineal, and vascular elements. Recent advances in molecular biology have improved our understanding of glioma pathogenesis, and several clinically significant genetic alterations have been identified. A number of these (IDH, 1p/19q codeletion, H3Lys27Met, and RELA-fusion) are now combined with histology in the revised 2016 WHO classification of CNS (Central Nervous System) tumours. This evolving genomics, combined with significant advances in cancer and CNS immunology, has defined a new era in neuro-oncology and holds promise for diagnostic and therapeutic advancement.

Understanding such molecular changes is likely to help with brain tumour diagnosis, grading, and treatment [7]. CNS tumours encompass a very broad spectrum with regards to age, location, histology, and clinical outcomes.

In our study, males (68%) outnumbered females (32%). In studies of the Indian population as well as the western population, the incidence of brain tumours is more common in men [8,9]. Study of brain tumours from North-East Indian population [10] showed the age of incidence was highest in 20-39 years age group which may be compared to that of our study (31-40 years followed by 21-30 years age group). The male:female ratio of incidence of primary brain tumours in the North-Eastern population was 2.3:1 [10] which is almost similar to that in our study (2.1:1). In a study of the

Indian population, the frequency of brain tumours is highest in the 5th decade, while our study shows the frequency to be highest in the 4th decade [8]. The most common presenting symptom was headache (53%), followed by vomiting (28%), which is comparable to the study of Western population, where headache was the most common symptom [9,11]. In our study and that of the western population, supratentorial tumours predominate over infratentorial tumours [11]. In our study, it was found that Glioblastoma and Astrocytomas are the two most common primary brain tumours, while in both the Indian and Western populations, Meningioma and Glioblastoma are the most common primary brain tumours [8,12]. Ependymomas represented 3% of all intracranial neoplasms in this study, which is equal to that in an Indian study [8] and comparable to 2% in western studies [8,9]. In this study, radiology and biopsy were used to make the diagnosis. In 10% of the patients, biopsy was not possible due to the diffuse infiltrative nature of brain stem and thalamic tumours.

In conclusion, from the study, we can conclude that the frequencies of the major histologic types of primary brain tumours, Glioblastoma multiforme and Astrocytoma were found to be higher than those of other Primary Brain Tumors (PBTs). In countries like India, where there is a scarcity of data because of inadequacies in tumour registration, hospital-based studies have a major role to play in the planning of the distribution of infrastructure and resources towards disease management and preventive programs. In this study, we can see that 7% defaulted on treatment (dropouts) and 10% didn't show up for treatment.

Thus, there is a need for proper counselling about the benefits of a completely non-invasive treatment modality like radiation for providing the best possible care to the patients.

Multimodality management, which includes surgery, radiotherapy, and chemotherapy, is still the gold standard for treating primary brain tumours. Analytical population-based studies with prospective approach that monitor the incidence-trends, risk factors and survival rates of patients with primary brain tumours are required for better outcomes.

References

References

1. Neurosurgical conditions and treatment <https://www.aans.org/en/Patients/Neurosurgical-Conditions-and-Treatments>.
2. GLOBOCAN 2020 data. <https://gco.iarc.fr/today/data/factsheets/cancers/31-Brain-central-nervous-system-fact-sheet.pdf>. (Last accessed on 01.03.2023).
3. Indian Council of Medical Research, Hospital Based Cancer Registry data (2021).
4. Goel A. Tumour induced hydrocephalus and oedema: Pathology or natural defence. *Journal of postgraduate medicine*. 2002; 48
5. Siegel A, Sapru HN. Essential neuroscience. Philadelphia: Lippincott Williams & Wilkins. 2010;380.
6. DeVita Jr VT, Rosenberg SA, Lawrence TS. DeVita, Hellman, and Rosenberg's Cancer: Short Title. Lippincott Williams & Wilkins; 2022 Sep 21.
7. Lapointe S, Perry A, Butowski NA. Primary brain tumours in adults. *Lancet (London, England)*. 2018; 392(10145) [DOI](#)
8. Meel M, Choudhary N, Kumar M, Mathur K. Epidemiological Profiling and Trends of Primary Intracranial Tumors: A Hospital-Based Brain Tumor Registry from a Tertiary Care Center. *Journal of Neurosciences in Rural Practice*. 2021; 12(1) [DOI](#)
9. Motah M, Gams Massi D, Bekolo F, Nju N, Ndoumbe A, Moumi M, Sango A, Shu P, Eyenga V. Epidemiological profile of brain tumors in Cameroon: a retrospective study. *The Egyptian Journal of Neurology, Psychiatry and Neurosurgery*. 2021; 57 [DOI](#)
10. Krishnatreya M, Katagi AC, Sharma JD, Bhattacharyya M, Nandy P, Hazarika M. Brief



descriptive epidemiology of primary malignant brain tumors from North-East India. *Asian Pacific journal of cancer prevention: APJCP*. 2014; 15(22)[DOI](#)

11. Soyemi SS, Faduyile FA, Sanni DA, Mgbehoma AI, Idowu OE, Obafunwa JO. Clinicoepidemiological profile and morphological spectrum of intracranial tumors seen in a tertiary health-care facility: A 6-year retrospective study. *Annals of Tropical Pathology*. 2020; 11(2):16.
12. Almutrafi A, Bashawry Y, AlShakweer W, Al-Harbi M, Altwairgi A, Al-Dandan S. The Epidemiology of Primary Central Nervous System Tumors at the National Neurologic Institute in Saudi Arabia: A Ten-Year Single-Institution Study. *Journal of Cancer Epidemiology*. 2020; 2020[DOI](#)