ORIGINAL ARTICLE

Primary Brain Tumours in Pediatric Age Group and the Patterns of Care in Patients of the North-Eastern Region of India: A Hospital Based Retrospective Analysis

Mouchumee Bhattacharyya[1], Moumita Paul[2], Munlima Hazarika[3], Apurba K Kalita[4], Nizara Baishya[5], Manoj K Kalita[6]

Authors' affiliations: [1]Professor; [2]Post-graduate Trainee, Dept. of Radiation Oncology, Dr. B. Borooah Cancer Institute, Guwahati; [3]Professor, Dept. of Medical Oncology, Dr. B. Borooah Cancer Institute, Guwahati; [4]Professor and Head, Dept. of Radiation Oncology, Dr. B. Borooah Cancer Institute, Guwahati; [5]Research Scientist; [6]Statistician(Technical Officer), Hospital Based Cancer Registry, Dr. B. Borooah Cancer Institute, Guwahati
Correspondence: Dr. Moumita Paul, Email: moumitapaul68.mp@gmail.com, Mob. No.: 8486403227, 9101546437

ABSTRACT

Background: Pediatric brain tumours are the most common solid tumours in children and comprise approximately 20-25% of all pediatric malignancies worldwide.

Aims: There is no data about the epidemiological profile of primary brain tumours in pediatric age group from the North-East India. The main aim of the study was to assess the epidemiological profile of pediatric brain tumours in children of the North-Eastern region of India and their patterns of care.

Materials and Methods: In this analysis, data regarding age, sex, community, site of the tumour, clinical features, histology, geographical distribution and treatment delivered were collected from hospital cancer registry**.**

Results: A total of 115 cases of pediatric primary brain tumours from age 0-18 years from 2012-2017 were identified and included in this study. According to this study, males (61.7%) slightly outnumbered females (38.3%) with a male: female ratio of 1.61:1 and incidence was most common in the 6-12 years age group. When divided according to anatomical site, primary brain tumours were found to be most common in cerebellum (44.35%) followed by cerebrum (36.26%). Infratentorial tumours (53%) were more than supratentorial tumours (47%). Histologically, the most common variety was found to be Medulloblastoma (34.8%) followed by Astocytomas (26.95%). Patients were mostly seen to belong to Middle Assam region (38.2%). Among the communities, Hindus (61.74%) were most commonly found to have primary pediatric brain tumours. Around 96% of the patients were offered to take radiotherapy out of which only 67% took radiotherapy, 2.6% defaulted treatment(drop outs) and 27% didn't turn up for treatment. 4.35% of the patients took other modalities of treatment.

Conclusion: Multimodality management including surgery, radiotherapy and chemotherapy remains the cornerstone in the management of pediatric brain tumours.

Key words: primary brain tumours, pediatric, epidemiology

INTRODUCTION

Primary brain tumours (PBTs) are a diverse group of benign and malignant neoplasms that arise from different cells of the brain parenchyma. Pediatric brain tumours are the most common solid tumours in children and the second most common cancer after leukemia.[1]They account for approximately 25% of all the pediatric cancers.[2]These tumours are an important cause of morbidity and mortality in both children and adults, often generating severe disabilities and producing high burden in both families and health care systems.[3]According to Indian Council of Medical Research, National Cancer Registry data, the incidence of pediatric brain tumour ranges from 0% - 2.11%.[4] The established risk factors for primary malignant brain tumours are genetic(p-53 mutation, Li–Fraumeni syndrome, Neurofibromatosis, etc.) and ionising radiations. Childhood CNS tumours differ significantly from adult brain tumours in reference to their sites of origin, clinical presentation, tendency to disseminate early, histological features and their biological behaviour. Whereas in adults the predominant CNS tumour types are metastases, glial neoplasms and meningiomas, in children, besides gliomas other major tumour types including primitive embryonal neoplasms are also common. Due to lack of resources, in this context, the adequate epidemiologic data lacks from India. The main objective of this

study is to assess the epidemiological patterns of PBTs in pediatric age group(0-18 yrs age) where we have tried to identify the age, gender, community, topography, and histopathology of the PBTs along with their compliance to treatment.Very little data and study on primary brain tumours of pediatric age group is available from the North-East region of India. This study may help in planning of the distribution of infrastructure and resources towards the disease management and preventive programmes. Need of proper counselling for the benefits of treatment can be planned if required and also to strengthen the follow up practices for providing the best possible care to our children.

MATERIALS AND METHODS

This is a retrospective, observational study. The medical records of children 0-18 years of age with primary brain tumour registered from January 2012 to December 2017 were obtained from the data base of a hospital cancer registry in the North–Eastern India. The dataset consisted of information of a total of 861 pediatric patients with cancer registered from January 2012 to December 2017. Strict confidentiality was maintained while handling the data sets. Data regarding age, sex, community, site of tumour, histology and compliance to treatment were collected and analysed. HPRs of all the patients were collected except for patients of Brainstem Gliomas where HPEs could not be done. Our analysis did not include the data of spinal tumours. Ethical Committee approval was taken before the initiation of the study.

RESULTS

A total of 115 cases of PBTs were identified.The age of the patients ranged from 0-18 years, with a mean age of 9.53 years.Of the 115 cases, males outnumbered females.There were 71 male patients and 44 female patients.The median age of incidence of PBTs was 10 years.The highest number of males was found to be in the age group 6-12 years whereas the highest number of females was found to be in the age group 0-5 years. Female preponderance was only seen in the age group 0-5 years (16/44) versus 12/71 in males. This study revealed Medulloblastoma (34.78%) as the most common PBT in the pediatric age group which was followed by Astrocyomas (26.95%). Cerebellum was found to be the most common anatomic site of location of the pediatric primary brain tumours accounting for 44.35% followed by cerebrum (38.26%). Patients with infratentorial tumours were more (53.04%) compared to patients with supratentorial tumours (46.96%). Patients were found to be hailing mostly from Middle Assam(38.26%) followed by Upper Assam(33.04%). Among the communities, Hindus (61.74%) were most commonly found to have PBTs followed by Muslims (30.43%) and Christians (7.83%).

Out of all 115 patients, even though 110 patients were offered radiotherapy, only 77(66.95%) patients took radiotherapy with chemotherapy, but 30 (26.09%) didnot turn up for radiotherapy. Three patients (2.61%) dropped out in between radiotherapy and the rest five (4.35%) were provided other modalities of treatment like only chemotherapy or palliative care.

Table 1: Demographic profile of Cases

Age group (In years)	Males	Females
0-5	12 (16.90%)	16 (36.36%)
6-12	38 (53.52%)	15 (34.09%)
13-18	21 (29.58%)	13 (29.55%)

Table 2: Clinical parameters

Parameters	Cases (n=115)
Histology	
Medulloblastoma	40 (34.78%)
Astrocytomas	31 (26.95%)
Brain stem gliomas (no histology report)	14 (12.17%)
Craniopharyngioma	6 (5.22%)
Oligodendroglioma	6 (5.22%)
Ependymoma	4 (3.48%)
Germ cell tumour	6 (5.22%)
Atypical Meningioma	3 (2.61%)
Atypical teratoid/rhabdoid tumour	3 (2.61%)
PNET	2 (1.74%)
Anatomical site	
Cerebellum	51 (44.35%)
Cerebrum	44 (38.26%)
Brain stem	14 (12.17%)
Ventricle	3 (2.61%)
Meninges	3 (2.61%)
Location w.r.t. tentorium	
Supratentorial	54 (46.96%)
Infratentorial	61 (53.04%)
Geographic location	
Upper Assam	38 (33.04%)
Middle Assam	44 (38.26%)
Lower Assam	21 (18.26%)
Other NE states	12 (10.43%)
Community	
Hinduism	71 (61.74%)
Muslim	35 (30.43%)
Christianity	9 (7.83%)
Treatment	
Took RT	77 (66.95%)
Drop out	3 (2.61%)
Didnot turn up for RT	30 (26.09%)
Other modalities of treatment	5 (4.35%)

*Histology study from patients of brainstem glioma could not be done due to infiltrative nature of the disease.
w.r.t. = with respect to,
NE=North-East,
RT=radiotherapy

Overall Survival

The overall survival at 5 years was found to be 20%. The median survival of all children was 26 months(standard error 4.435 and 95% CI=17.307-34.693).

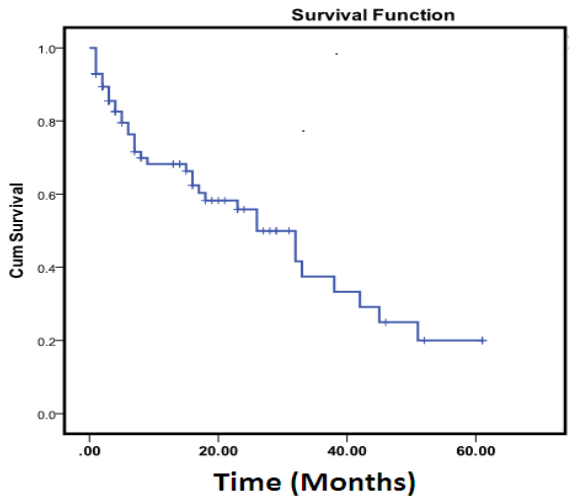

Fig 1. Overall survival

DISCUSSION

Brain and other CNS tumours rank second among childhood cancers(26%) after leukemias(30%) in the 0-14 years age group.[1,2]The incidence of brain tumours has been reported to be around 3.9 and 3.2 / 1,00,000/year in males and females respectively.[5]In India, 55%-120% increase in incidence of childhood brain tumours has been noted in both the sexes over the past 25 years.[6] Our analysis showed that the prevalence of PBTs in pediatric patients was around 14.63%(126/861). Various explanations have been proposed for this increase in incidence, most important of which is the use of magnetic resonance imaging for the diagnosis of intracranial abnormalities. Our analysis showed that the prevalence of PBTs was most common in pediatric age group 6-12 years.The mean age at diagnosis in our study was 9.53 years and this is almost similar to the mean age at diagnosis reported in a multi-institutional study of pediatric PBTs in Morocco(9.3 years)[7], higher than in Pakistan(14 years)[8], Iran(8.8 years)[9] but lower than in China(12.68 years).[10]The male:female ratio in our analysis was found to be 1.6:1,which is consistent with the literature.[7,11,12]The common anatomic sites for the development of PBTs in our population were centered on cerebellum followed by cerebral hemispheres. These studies were in line with the results of other published data.[13,14,15]The diagnosis, in this study, was mainly based on radiology and biopsy.In 12.17% of the patients,biopsy was not possible due to diffuse infiltrative nature of brainstem gliomas.In Western population, it has been found that Astrocytomas and Medulloblastomas are the two most common brain tumours in children. Various studies from Asian centres also confirm these data.In our study too, these two were the most common primary brain tumours in children but Medulloblastomas (34.78%) showed preponderance over Astrocytomas (~27%) which is almost similar to the multi-institutional study in Morocco[7] and consistent with findings of other published studies on pediatric brain tumours.[11,13,16]In our analysis, the tumor location with respect to tentorium revealed that the frequency of infratentorial tumours (53.04%) was higher than the supratentorial tumours(46.96%).Some previous studies reported nearly the same results[8,9,17]. The percentage of patients in our study who defaulted for radiation was quite high(28.7%).This reflected the inherent fear of patients about radiation therapy and the need for proper counselling about the benefits of a completely non-invasive treatment modality like radiation and also to strengthen the follow up practices for providing the best possible care to our children. The 5-year overall survival in our children was 20% with a median survival of 26 months. According to CBTRUS data (2000-2015 data), 5-year relative survival rates following diagnosis of a primary malignant brain and other CNS tumour in 0-19 years of age is 74.1%. The lower overall survival at 5 years in our institute may be due to lack of completion of treatment.

CONCLUSION

This study was an attempt to map the epidemiological profile of pediatric brain tumours in the North-East region of India. Multimodality approach including surgery, radiotherapy and chemotherapy remains the cornerstone in the management of pediatric brain tumours. Medulloblastomas and astrocytomas, which form the major histologic types in pediatric patients need special attention. The question of whether the present study truly depicts the regional prevalence or just a reporting bias can only be resolved by creation of a central database from all parts of India like a National Brain Tumour Registry. Future prospective analytical population-based studies that monitor the incidence-trends, risk factors, survival rates and quality of life of patients with PBTs will be required for better outcomes.

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