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Research Article

PREVALENCE PATTERN OF CNS TUMORS IN AND AROUND WARANGAL REGION

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A B S T R A C T

Introduction: CNS tumors comprises of Brain tumors, Spinal tumors, Lipomas, Osteomas and Tuberculomas. Although relatively rare, they are associated with morbidity and mortality and the significant proportion of affected young and middle-aged individuals has a major bearing on the death-adjusted life years compared to other malignancies. Prevalence rates are used to supplement descriptions of disease and these rates are unavailable for CNS tumors in India. The objective of the study is to record the prevalence and morbidity-mortality rates in CNS tumour patients.

Materials and methods: A Retrospective study dual center study was conducted for a period of six month in the department of neurosurgery in Warangal region. The prevalence data was obtained for different types of CNS tumors and this data was then used for the estimation of incidence, Age at the time of diagnosis and mortality rates.

Results: A total of 180 patient's data was included in the study. Brain tumours were found to be more prevalent representing 66.6% of all CNS tumours. Brain tumors were highly prevalent in males, spinal tumor in females. Overall prevalence of CNS tumors was highest in the age group of 40-49 years, mortality was observed in 24 (16.8%) patients.

Conclusion: The study concludes that the age at the time of diagnosis, type of tumor and tumor grade were regarded as the significant predictors of prognosis.

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INTRODUCTION

Tumors of CNS are group of neoplasm's having different prevalence in different sex and age groups and various parts of CNS. Though they are not very common, result in significant morbidity because of poor survival rate. The incidence of CNS tumors in India ranges from 10-17 per 100,000 population with an increasing trends and accounts for 2% malignancies (1). The world age-standardized incidence rate for all primary brain tumors ranged from 4.3 to 18.6 per 100,000 per year (9). Advances in diagnostic methods have revealed a trend towards an increased diagnosis of CNS tumors. In developing countries like India, the exact burden of disease is underestimated due to lack of complete registration of newly diagnosed cases. Therefore, hospital based prevalence data forms a basis for estimating the disease load (2).CNS tumors are a complex heterogeneous group of benign and malignant tumors, with more than 100 histological subtypes from brain to spinal cord (3). CNS tumors are classified into 7 categories: Tumors of neuroepithelial tissue, tumors of cranial and spinal nerves, tumors of meninges, lymphomas and hematopoietic neoplasm's, germ cell tumors, tumors of sellar region and metastatic tumors(4). WHO assigned a grading system to CNS tumors according to its degree of malignancy. Starting with most benign as grade I, grades II, III and IV represent increasing malignancy (5). Brain tumors are classified based on location and the character (benign, malignant, primary or secondary). Malignant lesions are uncommon, but their incidence has increased in developed countries. The established risk factors are genetics, immune factors and ionizing radiations (6). Spinal tumors are 10 times less frequent compared to intracranial tumors. Spinal tumors are classified as extradural and intra dural tumors based on their location. Intradural tumors are further classified as intramedullary and extramedullary (7). Symptoms of CNS tumors are nonspecific and are presented frequently in other conditions. Symptoms depend on the size and location of tumor. Symptoms of brain tumor includes headache, seizures, nausea or vomiting, facial numbness, muscle weakness or paralysis, fatigue, drowsiness, insomnia, vision problems, changes in speech , hearing , memory and inability to perform

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daily activities (8). Clinical presentation of spinal tumors usually relates to pain, motor and sensory deficits as well as bowel bladder involvement (7).

CNS tumors are the important cause of morbidity and mortality, often generating severe disabilities and producing high burden in both families and health care systems. Mortality depends on the type, grade and location of tumor (9).

MATERIALS AND METHODS

Our study was a retrospective dual center study (Rohini super speciality hospitals, Hanamkonda and Life line hospitals, Hanmakonda) carried out for a period of 6 months after obtaining approval from Institutional Ethics Committee. All the patients diagnosed with CNS tumors and treated with surgery as the main modality of treatment are included in the study. The inclusion criteria include all the patients who underwent surgery for CNS tumour. The patients who were treated with other treatment options were excluded. Of 180 patients who were enrolled in our study 37 patients were eliminated due to loss of follow-up. Patient data was obtained from case sheets and interaction with patients and care givers.

RESULTS

Of 180 patients clinically diagnosed CNS tumors, 66.7 % were brain tumors and 23.8 % are spinal tumors. The remaining 9.5% tumors include osteoma, lipoma and tubeculoma. Out of 120 brain tumor cases, 67 were male and 53 were female. Among 43 spinal tumor cases, 23 were female. From this it's imperative that brain tumor was highly prevalent in males, spinal tumor in females. The number of meningioma cases are 53 and the male to female ratio of was approximately 1:2. The male to female ratio was 6:1in glioma cases (38). It was observed that CNS tumors are highly diagnosed at the age of 40-49 years, followed by 30-39 years. CNS tumors were least prevalent in geriatric patients (>70 years of age).

Among 120 brain tumor patients meningiomas (44.2 %) were the most common entity followed by gliomas (23.3 %). GBM accounts for 10% of cases and astrocytomas account for 4.2 % of cases.

Out of 120 brain tumor cases, 33.3 % were observed in parietal region, followed by frontal (29 %), occipital (20 %) and temporal regions (16 %). Among 43 spinal tumor cases, highest number of spinal tumors were observed in lumbar region (44.2 %) followed by thoracic region (27.9 %). The least number of cases were observed in cervical region (4.7 %).

A wide range of histolopathological spectrum of CNS tumors was observed and was classified according to WHO classification system. Majority of the meningiomas were diagnosed in early stages. Majority of gliomas were diagnosed in grade II and grade III. GBM cases were diagnosed in late stage i.e Grade IV. Hemangioblastomas and oligodendrogliomas were diagnosed in grade I and grade III respectively.

Mortality was observed in16.8 % of study population. Mortality was high in the age group of >70 in case of gliomas. In case of grade IV GBM and grade III meningioma, mortality was high in the age group of 50-59. Metastatic tumors had the highest mortality rate at age 60-69. In case of spinal tumors mortality is high in the age group of < 30 years.

Table 1 Distribution based on type of CNS tumor

S.No	Tumor type	Number of patients	Male	%	Female	%
1.	Brain tumour	120	67	55.8	53	44.1
2.	Spinal tumour	43	20	46.5	23	53.5
3.	Tuberculoma	05	2	40	3	60
4.	Osteoma	05	2	40	3	60

Table 2 Tumor type and gender distribution of brain tumors

S. No	Tumor type	Male	%	Female	%	Total
1	Meningioma	18	33.9	35	66.03	53
2	Glioma	24	85.7	4	14.13	28
3	GBM	7	58.3	5	41.6	12
4	Hemangioblastoma	4	100	0	0	4
5	Astrocytoma	2	40	3	60	5
6	Schwanoma	1	33.3	2	66.6	3
7	Pituitary adenoma	3	75	1	25	4
8	Adenocarcinoma	0	0	1	100	1
9	Oligodendroglioma	1	100	0	0	1
10	Pineal tumour	0	0	1	100	1
11	Metastatic tumour	4	50	4	50	8

Table 3 Age wise distribution of CNS tumors

S. No	Age	Number	%
1	<30	23	12.8
2	30-39	38	21.1
3	40-49	46	25.6
4	50-59	39	21.7
5	60-69	23	12.8
6	>70	11	6

Table 4 Age distribution based on type of Brain tumor

Type of brain tumor	Age group (years)					
	<30	30-39	40-49	50-59	60-69	>70
Meningioma	4	10	18	12	8	1
Glioma	2	10	6	5	1	4
GBM	1	1	2	7	1	0
Astrocytoma	1	2	1	0	1	0
Hemangioblastoma	1	1	2	0	0	0
Schwanoma	0	0	2	1	0	0
Oligodendroglioma	1	0	0	0	0	0
Metastatic tumor	0	0	1	1	4	2
Pituitary adenoma	1	1	0	1	0	1
Adenocarcinoma	0	1	0	0	0	0
Pineal tumor	0	0	0	0	1	0

Table 5 Age wise distribution of spinal tumors

S.No	Age group (years)	Number	%
1	<30	4	9.3
2	30-39	10	23.3
3	40-49	11	25.6
4	50-59	9	20.9
5	60-69	6	13.95
6	>70	3	6.9

Table 6 Grade wise distribution of Brain tumors

S. No	Tumor type	Grade – I	Grade -II	Grade – III	Grade - IV	No grade
1	Meningioma	28	19	3	0	0
2	Glioma	4	10	8	6	0
3	Astrocytoma	0	3	2	0	0
4	GBM	0	0	0	12	0
5	Oligodendroglioma	0	0	1	0	0
6	Hemangiobalstoma	4	0	0	0	0
7	Metastatic tumors	0	0	0	0	8
8	Pituitary adenoma	0	0	0	0	4
9	Adenocarcinoma	0	0	0	0	1
10	Pineal tumors	0	0	0	0	1
11	Schwanoma	0	0	0	0	3

Table 7 Tumor wise distribution of mortality in different age groups

S.No	Tumor type	<30	30-39	40-49	50-59	60-69	>70
1	Glioma	0	2	0	0	0	3
2	GBM	1	0	1	4	0	0
3	Metastatic tumor	0	0	1	1	2	1
4	Meningioma	0	0	0	2	0	0
5	Astrocytoma	0	0	0	0	1	0
6	Adenocarcinoma	0	1	0	0	0	0
7	Hemangioblastoma	0	0	1	0	0	0
8	Spinal tumors	2	0	0	0	1	0

Table 8 Mortality based on Tumor Grading

S.No	Tumor type	Grade – I	Grade - II	Grade - III	Grade - IV	No grade
1	GBM	0	0	0	6	0
2	Meningioma	0	0	2	0	0
3	Hemangioblastoma	1	0	0	0	0
4	Astrocytoma	0	0	1	0	0
5	Adenocarcinoma	0	0	0	0	1
6	Metastatic tumors	0	0	0	0	5
7	Gliomas	0	0	0	0	5

DISCUSSION

Type of tumour: In our study 66.7 % of the CNS tumors were brain tumors followed by spinal tumors (23.8 %). The remaining 9.5 % tumors include osteoma, lipoma and tuberculoma. It was observed that most common form of brain tumor was meningioma (44.2 %) followed by glioma (23.3 %). The results are similar to the study conducted by Gigi Neishvill *et al,* 2014 in which meningioma was the commonest brain tumor (10), where as in a study conducted by Jain *et al*, 2017 astrocytoma was most common brain tumor followed by meningioma (11). The differences in relative frequency and tumor distribution among population in different places may be due to genetic and environmental factors.

Gender: Our study showed slight variation in the sex distribution of overall CNS tumors i.e. male accounted for 53.8 % and female were 46.1 %. We observed that female outnumbered male in case of meningioma (male to female ratio was 1:2 approximately). Jain *et al,* 2017 also reported that meningiomas affected female more than male (11). This may be due to expression of higher levels of progesterone receptors on meningioma (13). The male preponderance was most striking in glioma i.e. 85.7 % of glioma patients were male, similarly Surawicz *et al,* 1999 observed that 40 % more males were affected with glioma than females (14).

Age: We observed that CNS tumors are commonly present in patients between age group 30-59 years with the peak incidence around 40-49 years. Patients >30 years and 60-69 age group comprised 12.8 % each and declined after the age of 70 years (6 %) which is comparable to the study conducted by S.K.Khang *et al*, 1989 (21-50 years with peak around 40 years) (15). Majority of the brain tumors were observed in age group of 31-60 years which was similar to the observation made by Jain *et al* (11).

Tumor grade: In a study conducted by Jain C *et al*, 2017, grade I tumors were common (11), where as in our hospital set up, majority of the tumors belong to grade II. Majority of the meningiomas were grade I and all the GBM tumors belong to grade IV. Delayed presentation of our patients to hospital could be the possible cause.

***Mortality*:** The 5 year survival rate of malignant CNS tumors is 34.9 % and for non malignant tumors it is 90.47 % (16). In the present study mortality rate was high in male (62.5 %) compared to female (37.5 %), similar observation was made by Quinn. T. Ostrom *et al,* 2015 (17).

Patients with GBM have poor survival rate and only 3-5% patients survive more than 5 years and the median survival is 12-15 months (12). In our study the mortality rate of GBM patients was 50 %. This is because GBM is a grade IV malignant brain tumor with high degree of invasiveness.

In our study the survival rate of meningoma patients was poor in age group 50-59 which was similar to the observation made by Hanna van alkemade *et al*, 2012 (18). In a study conducted by Bridget J *et al,* five year survival rates were estimated as 70.1 % for Benign and 55 % for malignant meningioma (19). Our study reported 96.2 % survival rate for meningioma, this may be due to diagnosis of meningiomas in early stages.
Xuezhi Dong *et al*, 2016 reported that the median survival for patients with grade-II astrocytoma ranges from 5-8 years and for grade-III it is 3 years (20). In our study one patient with grade III tumor survived less than 1.5 years after being diagnosed with astrocytoma.

CONCLUSION

CNS tumors in our study include brain tumors, spinal tumors and other CNS tumors like Osteoma, lipoma and tuberculoma. 66.7 % of all the CNS tumors were brain tumors followed by spinal tumors. The most common brain tumor was meningioma (44.2 %) followed by glioma (23.3 %). The prevalence was predominant in male (53.8 %) compared to female. Overall prevalence of CNS tumors was highest in the age group of 40-49 years. In patients with age above 50 years, tumors like GBM, glioma, metastatic tumors and late diagnosis (grade IV) in case of GBM, meningioma and astrocytoma were concluded as the cause of mortality. Age at the time of diagnosis, type of tumor and tumor grade were regarded as the significant predictors of prognosis.

The epidemiology of CNS tumors is poorly understood due to lack of comprehensive and upto date data. A better understanding of incidence and prevalence of CNS tumors can help better planning in the allocation of health resources. Creating awareness on core set of clinical features will help in early diagnosis which in turn decreases the disease progression and mortality rate.

Abbreviations

1. CNS – Central Nervous System
2. GBM- Glioblastoma Multiforme
3. WHO- World Health Organisation

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