



Original Research Article

Descriptive epidemiology of central nervous system tumors in rural hospital of central India : 5-year experience

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ABSTRACT

Introduction: We have undertaken this study to find the spectrum of CNS tumors in our setup over a period of 5 years.**Materials and Methods:** Retrospective analysis of CNS tumors in last 5 years in our setup was done. The tumor which were histopathologically proven were included in the study. Undiagnosed cases and tumors of peripheral nerves were excluded. Tumors were classified according to the WHO 2007 classification for CNS tumors.**Results:** Total 168 tumors were included in the study. There were 93 male (67.7%) and 75 female patients with male: female ratio of 1.24: 1. The median age at diagnosis 41.3 years. For Adults, most common tumor found was of Neuroepithelial tissue (36.9%) other being tumors of meninges (26.78%), tumor of cranial & spinal nerves (20.24%), sellar region(8.93%), metastatic tumors (5.95%) & germ cell tumor (1.19%). Among neuroepithelial tumors, most common group of tumors was astrocytic tumors. Paediatric tumor comprised of 7.14 % of population. The most common paediatric tumor was Astrocytoma (25%) and medulloblastoma (25%).**Conclusion:** At present there is no study about epidemiology of CNS tumors in central India. This study may provide the representative incidence of various types of CNS tumors for our region.

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1. Introduction

CNS tumors comprises less than 3 % of total body tumors¹. The annual incidence of primary malignant brain tumors is ~3.7 per 100,000 for males and 2.6 per 100,000 for females^{2,3}. The incidence in India ranges from 5 to 10 per 100,000 population with increasing trend and accounts for 2% of total malignancies^{4,5}.

The WHO classification of brain tumors in 2007 comprised of major groups as Tumors of neuroepithelial tissue, Tumors of meninges, Lymphomas and Haematopoietic neoplasm, Germ cell tumors, Tumors of sellar region, Metastatic tumors & Tumors of cranial and paraspinal nerve⁶. In 2016 WHO proposed the new classification of CNS tumors. For the first time, WHO classification used molecular parameters in addition to histology to define

various tumors⁷.

Astrocytomas (38.7%) were the most common primary tumors with the majority being high-grade gliomas (59.5%) for adults in India⁸. The most common primary paediatric brain tumors were astrocytic tumors (34.7%), followed by medulloblastoma and supratentorial primitive neuro-ectodermal tumors (22.4%), craniopharyngiomas (10.2%) and ependymal tumors (9.8%). The most common astrocytic tumor was pilocytic astrocytoma⁹.

Reports in the literature indicate that worldwide variations exist in the pattern of CNS tumors with respect to Age, incidence, anatomical locations, gender preferences, and histological types.

Hence, epidemiological data on CNS tumor is useful for future research for specific locality. In India, hospital based registration system form the bulk of the data for estimating the disease load in the community. Until date, no epidemiological study on CNS tumor was done for central

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India region. The aim of this study is to find the spectrum to CNS tumors in our setup and compare with other studies.

2. Materials and methods

This is a retrospective observational study conducted during the period of 2014 to 2019 in MGIMS, Sevagram. The inclusion criteria consist of all CNS tumor cases diagnosed in neurosurgery department, which were histopathologically proven. The exclusion criteria consist of inoperable cases, undiagnosed cases and tumor of peripheral nerves. Total 168 cases fulfilled the above criteria and were included in the study.

3. Results

This retrospective study was conducted for period between Jan 2014 and Feb 2019, in MGIMS Sewagram. Total 168 histopathological proven tumors were included in the study. Of total CNS tumors 142(84.4 %) comprised of intracranial tumors and rest 26(15.4 %) comprised of spinal tumors. Paediatric tumor (<19 years) comprised of total 7.14% percent of the tumor. The CNS tumor had slight male preponderance with M :F ratio of 1:1.24. Age of patient varies from 2 to 78 years Figure 1 with average age of 41.3 years. For paediatric CNS tumor the M :F ratio was 1:1 with average age of 12.25 years. Tumor were classified according to WHO classification 2007.

Most common tumor found was of Neuroepithelial tissue (36.9 %) other being tumors of meninges (26.78%), tumor of cranial & spinal nerves (20.24 %), sellar region (8.93 %), metastatic tumors (5.95%) & Germ cell tumor (1.19%) (Figure 2 , Table 1).

Neuroepithelial tumors (62 cases) comprised mainly of astrocytoma (48 cases, 77.41%), others being oligodendroglial tumors (4 cases, 6.45%), embryonal tumors (3 cases, 4.83%), ependymal tumors (3 cases, 4.83%), mixed neuronal-glial tumors (2 cases, 3.22 %), oligoastrocytic tumors (1 case, 1.61 %) & choroid plexus tumor (1 case, 1.61%).

Among astrocytic tumors (48 cases), Glioblastoma (23 cases, 47.92%) was most common followed by diffuse astrocytoma (14 cases, 29.17 %), anaplastic astrocytoma (8 cases, 16.67%) & pilocytic astrocytoma (3 cases, 6.52 %). WHO grade IV was the most common astrocytic tumor (Table 2). For astrocytic tumors, average age of presentation was of 38.51 years. For glioblastoma, average age of presentation was 50.5 years, with M:F ratio of 2.2 :1.

Tumors of meninges constitutes (45 cases) 26.8 % of total CNS tumors. Meningioma comprised of (44 cases) 97.3% while hemangiopericytoma comprised of (one case) 2.7%. Average age of presentation of meningioma was of 44.1 years with M:F ratio of 1 :1.32. WHO grade I comprised of 95.45% while WHO grade II comprised of 4.55% of total tumors.

Tumors of sellar region comprised of (15 cases) 8.9% of the total CNS tumors.

Secondaries in brain constitutes (10 cases) 5.9 % of total CNS tumors with average age of 50 years with M:F ratio of 1:1.25. The most common cause of secondary was primary lung tumor followed by breast tumor (Figure 3).

Spinal tumors consists of (26 cases) 15.4 % of tumors. Average age of presentation of spinal tumor was 42.1 years with female preponderance (M:F = 1:1.36). Most common spinal tumor was schwannoma (15 cases) followed by meningioma (7 cases).

In our study paediatric tumor comprised of (12 cases) 7.14% of the study population. The mean age of presentation was 12.25 years with M :F ratio of 1:1. The most common tumor being Astrocytoma (25%) and medulloblastoma (25%).

Table 1: Histopathology subtypes of diagnosed brain tumors

Types of brain tumor	Subtype	Number of cases
Neuroepithelial tumors	Astrocytic tumors	48
	Oligodendroglial tumors	4
	Embryonal tumors	3
	Ependymal tumors	3
	Mixed neuronal-glial tumors	2
	Oligoastrocytic tumors	1
Tumors of meninges	Choroid plexus tumors	1
	Meningioma	44
	Hemangiopericytoma	1
Tumors of cranial and paraspinal nerves	Schwannoma/Neurofibroma	34
Germ cell tumors	Germinoma	2
Tumors of sellar region	Pituitary adenoma	14
	Craniopharyngioma	1
Metastatic tumors	Metastasis	10
	Total	168

Table 2: Relative frequency of astrocytoma according to WHO grading

WHO Grading	No. of cases
Grade I	3
Grade II	14
Grade III	8
Grade IV	23
Total	48

4. Discussion

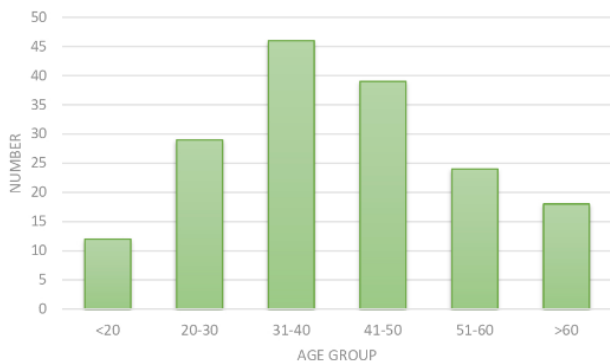
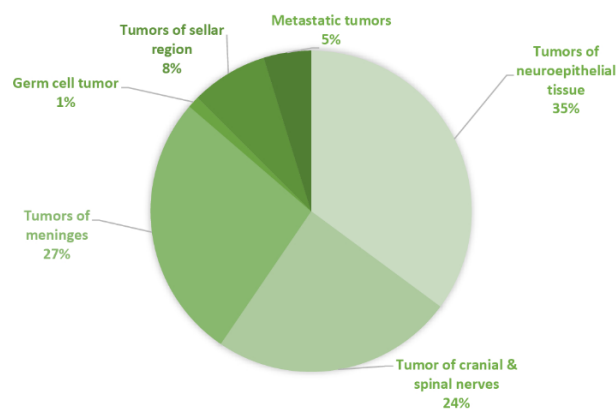
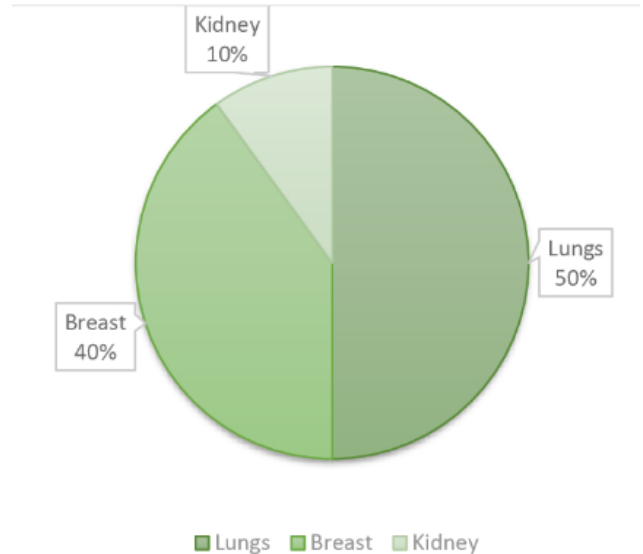
Tumor of CNS are rare and comprised of <3 % of total body tumors. In our study out of 168 tumors, 142(84.6

Table 3: Histopathology of meningioma

Types of meningioma	Present study (%)
Meningothelial	47.72
Psammomatous	13.63
Transitional	13.63
Fibroblastic	11.36
Angiomatous	9.09
Atypical	4.54

Table 4: Histopathology of Spinal tumor

Histopathology	Number of cases
Schwannoma	15
Meningioma	7
Ependymoma	3
Metastasis	1
Total	26

**Fig. 1:** Age wise distribution of CNS tumors**Fig. 2:** Distribution of CNS tumors**Fig. 3:** Site of Primary for Brain metastasis

(%) were intracranial tumors while 26 were spinal tumors (15.4%). Percentage of intracranial tumor was lower than other publications by Jalali R et al (95%)⁸, Suh YL et al (93.5%)¹⁰ & USA data (94.3%)¹¹.

In our study, the most common tumor was astrocytic tumors (28.57%), out of which the majority were glioblastoma (47.92%) followed by diffuse astrocytoma (29.17 %). In a study done by Dasgupta A et al, Astrocytomas (38.7%) were the most common primary tumors with the majority being high-grade gliomas (59.5%)¹². Ghosh et al¹³, Jalali and Datta⁸ and Patty¹⁴ also reported astrocytomas to be the commonest tumor. Study by Collins vp et al¹⁵, Das et al¹⁶, Suh YL et al¹⁰ and Lee et al¹⁷ reported meningioma as the most common tumor. Our study shows Meningiomas as second commonest tumor (26.19%). Iyengar and Chandra¹⁸, Wen-quiring et al¹⁹ and Patty¹⁴ made similar observations. Our study had female preponderance with M:F ratio of 1:1.3 for meningioma. In other study by Rohringer et al²⁰, M:F ratio was 1:2. The most common histopathological entity encountered in our study was meningothelial variant (47.72%) Table 3. Sangamithra et al²¹, Nasrin Samadi et al²², Gursan et al²³, all reported meningothelial as the most common variety. Spinal meningiomas comprised of 15.9% of total meningiomas in our study. In study done by Solero CL et al spinal meningiomas consist of 7.5-12.7 % of all CNS meningiomas. In our study the most common location, for spinal meningioma was thoracic spine which is similar to the other study reported^{24–26}.

Tumor of sellar region comprised of 8.9%, which was slightly higher than the study conducted by Jalali et al (8.3%)⁸ and Goh et al (8.6%)²⁷.

Secondaries in brain constitutes 5.9 % of total CNS tumors. It goes similar to study of Suh et al (6.0%)¹⁰ but higher than that of Lopez-Gonzalez et al(4%)²⁸. Indian study by Jalali et al⁸ reported 11.6% as secondaries in brain, which was significantly higher than our study. The most common cause of secondary was primary lung tumor followed by breast tumor. It was similar to the study conducted by Singh et al²⁹.

Spinal tumor comprised of 15.4 % of tumor. The most common spinal tumor was schwannoma (57.69%) followed by meningioma (26.92%) Table 4. Albanese and Platania, 2002, reported that spinal Intradural extramedullary tumors account for 2/3rd of all intraspinal neoplasms and are mainly represented by meningiomas (25 – 46%) and schwannomas³⁰. Schellinger et al reported that the most common histologic types were meningiomas (29%), nerve sheath tumors (24%), and ependymomas (23%)³¹. Cause of this variation is not known. It could be due to the small sample size or due to the variation in local population.

Paediatric tumor comprised of 7.14 % of population. The most common paediatric tumor was Astrocytoma (25%) and medulloblastoma (25%). Chen et al found astrocytomas to be leading tumors (29.2%) in this age group³². Similarly, study by Jain et al indicated that astrocytomas averaged 34.7% (range 22.3-46.7%), were the commonest paediatric tumors in India followed by medulloblastoma and PNETs (22.4%)⁹.

5. Conclusion

Most common group of tumor in our study was astrocytoma followed by tumor of meninges. In astrocytic tumors, the most common variety was Glioblastoma multiforme. As there is no study for central India, this study may provide the representative incidence of various types of CNS tumors.

6. Source of Funding

None.

7. Conflict of Interest

None

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