# Spectrum of Central Nervous System Tumours - Histopathological Study of 80 Cases at a Single Center

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## ABSTRACT

**Introduction:** Recent studies showed an increase in the incidence of central nervous system (CNS) tumours. Current research aimed to study the histopathological spectrum of CNS tumors irrespective of age in single tertiary care center for the last two years.

**Material and methods:** The H and E stained histopathological slides of biopsy of CNS tumors received from September 1st 2018 to August 31st 2020 were retrieved. The slides were examined and in necessary situations immunohistochemistry was carried out and the diagnosed cases were grouped based on WHO 2007 classification.

**Results:** Among the 80 CNS tumors, the majority (76 cases, 95%) presented as space occupying lesion in the brain and remaining 5% (4 cases) were intra-spinal tumors. We found that Tumors of neuroepithelial tissue (40 cases, 50%) was the most common entity followed by the c (28 cases, 35%), followed by metastatic tumors (5 cases, 6.25%).

**Conclusion:** The common occurrence of neuroepithelial tissue tumors and neuroepithelial tissue in our sample is similar to similar studies in different population.


**Key Words:** Astrocytoma, Central Nervous System Tumors, Meningioma, WHO 2007 Classification

## INTRODUCTION

Since last century, brain tumors were classified mainly on basis of histogenesis i,e. based on the cells of origin and their supposed levels of differentiation. But due to overlapping of entities and newer lesions there was a need for internationally standardized terminology and classification and hence newer classifications were based on both histopathological and molecular features. The 2016 WHO classification has included molecular information into diagnoses and classification as must.[1,2]

International Agency for Research on Cancer (IARC) report showed that the CNS tumors incidence worldwide in 2002, was 3.7/100,000 and 2.6/100,000 persons among males and females respectively. Since then there is an overall increase throughout the world, particularly in less developed countries. In developing countries like India, as there is a lack of a standard registration records of newly diagnosed cases with local cancer registries, we are unable to estimate the exact tumor burden and it remains underestimated. Therefore Hospital-based prevalence data, forms the basis for estimation of the disease load. Recent improvement in knowledge of record maintenance and improved diagnostic facilities and better healthcare, CNS tumors incidence seems to be on the rise in developing countries.[3-7]

We carried out this study with the aim to study the CNS tumors histopathological spectrum at a hospital for a period of two years.

## MATERIAL AND METHODS

The period of study was from September 1st 2018 to August 31st 2020, after obtaining institutional ethical committee clearance of Prathima Institute of Medical Sciences, Karimnagar, Telangana State, India, and informed consent from the subjects.

Biopsy slides of CNS tumors received in the study period were evaluated. All the cases were given diagnosis and confirmed with immunohistochemistry when needed and classified based on the WHO 2007 classification.

**Inclusion criteria:**

1. Diagnosed CNS tumors during study period

**Exclusion Criteria:**

1. The tumors of peripheral nervous system,
2. Non-neoplastic conditions of the CNS.

A total of 80 cases of CNS tumors were studied, and their histological typing and grading was done. The data was analyzed with Statistical Package for the Social Sciences (SPSS version 20.0) software.

## RESULTS

Among the 80 CNS tumors, the majority (76 cases, 95%) presented as space occupying lesion in the brain and remaining 5% (4 cases) were intra-spinal tumors. When gender was compared, there was a male predominance (45 Males and 35 females: 1.28:1). The subjects had a mean age of 42.5 years. Of all the CNS tumors, the pediatric tumors were 10 in number (12.5%) (Table 1 and Graph 1).

We found that Tumors of neuroepithelial tissue (40 cases, 50%) was the most common entity followed by the tumors of meninges (28 cases, 35%), followed by metastatic tumors (5 cases, 6.25%) (Table 2).

Among the tumors of neuroepithelial tissue, astrocytic

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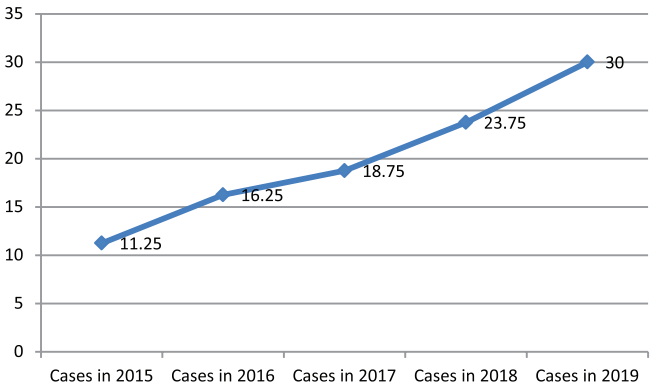
| Variable | Number of cases | Percentage of cases |
|---|---|---|
| Gender (Males/Females) | 45/35 | 56.25%/43.75% |
| Pediatric Tumors | 10 | 12.5% |
| Cases in 2018 | 24 | 30% |
| Cases in 2019 | 38 | 47.50% |
| Cases in 2020 | 18 | 22.5% |

**Table-1:** Demographic Profile of the Study Subjects

| Tumor type | Percentage of cases |
|---|---|
| 1. Tumor of Neuroepithelial tissue<br>A. Astrocytic tumors<br>B. Oligodendroglial tumors<br>C. Mixed gliomas<br>D. Ependymal tumors<br>E. Choroid plexus tumors<br>F. Embryonal tumors | 50% |
| 2. Tumors of meninges<br>A. Meningiomas<br>B.Atypical meningiomas<br>C. Mesenchymal, non-meningothelial tumors | 35% |
| 3. Tumors of peripheral nerves<br>Neurofibroma | 3.75% |
| 4. Tumors of uncertain histogenesis<br>Hemangioblastoma | 1.25% |
| 5. Lymphomas and haemopoietic neoplasm<br>Plasmacytoma | 1.25% |
| 6. Tumors of the sellar region Craniopharyngi-oma | 2.5% |
| 7. Metastatic tumors | 6.25% |

**Table-2:** Distribution of CNS tumors based on histologic sub-types and WHO grading




**Graph-1:** Year-wise percentage distribution of the cases

tumors (16 cases, 40%) were predominant, where as among the astrocytic tumors, anaplastic astrocytomas Grade III (8 cases, 50%) was the commonest type. Among the tumors of meninges, meningiomas were in majority (9 cases, 32.14%: Fig 1 and 2). There was a histologic diversity in pediatric tumors with astrocytic tumors (4 cases, 25%) being the majority subtype. The median age in pediatric tumors was 9.8 years with equal male to female ratio (1:1).

## DISCUSSION

The effect that CNS cancer has on health-care systems is

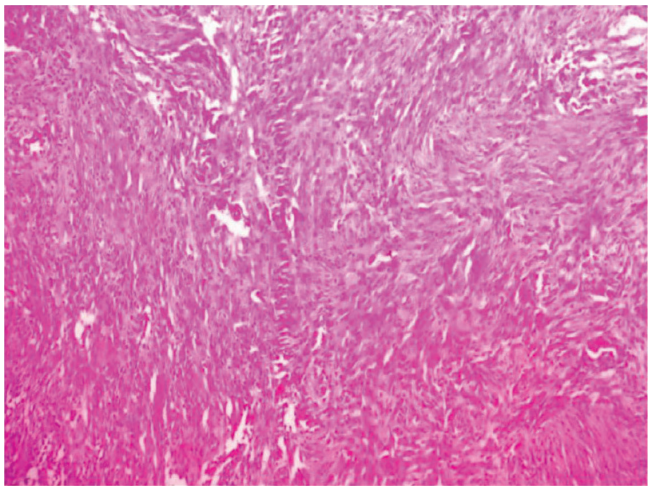


**Figure-1:** Photomicrograph of Transitional Meningioma (Meningothelial cells are arranged in lobules alternating with spindle shaped cells in fascicles)

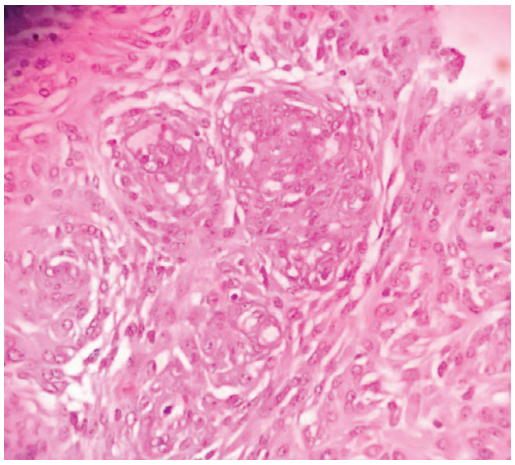


**Figure-2:** Meningothelial Meningioma (Tumor cells arranged in lobules to whorled masses and in syncytium)

out of proportion with incidence due to the high rates of mortality and inherently disabling effects it has on patients, often preventing independent functioning. The signs and symptoms associated with CNS cancer are heterogeneous, dependent on histopathology and affected anatomical regions, and include headaches, vision loss, seizures, speech disturbance, and paralysis. The burden of CNS cancer is compounded by the fact that effective treatment is multimodal and requires access to neurosurgical care, radiation, and chemotherapy. This highly specialised care for CNS cancer is not widely available in many areas of the world.[1-4]

In these contexts, it is important to understand the distribution of CNS cancer to inform local, national, and international efforts to allocate health-care resources appropriately. There is a need for future epidemiological reviews of brain tumors as they can reveal the happening changes in the spectrum of CNS tumors among different population, so that probable risk factors, and possible management methods can be assessed.[2,3]

Adult CNS tumors differ significantly from pediatric brain

tumors in aspects of sites of origin, presentation clinically, dissemination tendency, histopathological features and their biological behavior. While in adults the majority of CNS tumor types are metastases, glial neoplasms, and meningiomas. In children, gliomas are the major tumors and primitive embryonal neoplasms are also common. Recently there is an superior understanding of the biological variations between childhood and adult CNS tumors which has led to improvements in therapeutic approaches for each tumor type.[8-10]

We found that male to female ratio was M:F= 1.28:1 showing male preponderance which is similar to study findings of Nibhoria S et al with the ratio of M:F= 1.2:1.[2] However in a study in Singapore conducted by Das A et al, a female preponderance of 52.6% was seen.[11] Similarly a study by Kakshapati et al showed a female predominance of 1.3:1.[12]

The age group of CNS tumors in our study being 21-40 years was in accordance with Krishnatreya M et al who found majority in the age-group of 20- 39 years.[13]

We found that the tumors of neuroepithelial tissue and the meninges were the two commonest lesions (50% and 35%, respectively). France database (2004-2008) showed that these two tumors 53.9% and 28.8%, respectively.[5] CBTRUS (Central Brain Tumor Registry of the United States) data from 2004-2007 recorded rates of 33.7% and 35.5%, respectively.[6]

Our findings revealed that the CNS tumors in children and teenagers showed a significant histologic diversity. The disease pattern was different in different age groups 0-10 years and 12-20 years. In the former age group, embryonal tumors were prevalent and in the later group, astrocytic tumors were common. This finding is in accordance with study of Lee CH et al.[14]

We found metastatic tumors as the third commonest group which was similar to the Alexandru et al study.[7] However in a multi-institutional study did by Jain et al, they found a slight higher proportion of astrocytoma as compared to our study.[4] On a whole our findings are almost similar to many studies carried out nationally and internationally for every tumor category.

**Limitations**

1. Ours being a single-center study, the data could not represent the exact epidemiology of CNS tumors.
2. Lower sample size

## CONCLUSION

This study retrospectively analyzed a large-scale and long term pathological database from a single center. The findings correlated with similar studies in India could model similar changes that will occur in other developing countries.

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