

## A PROSPECTIVE HISTOPATHOLOGICAL-BASED STUDY OF BRAIN TUMOURS IN A REFERRAL CENTRE

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### ABSTRACT

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#### BACKGROUND

Brain neoplasms occur at all ages and account for around 2-3 percent of all deaths in adults. In children, the frequency increases to more than twenty percent. In children, it forms the second most common type of malignancy. Most of the tumours encountered are not related to any identifiable risk factors except for irradiation and some hereditary syndromes like subependymal giant cell astrocytoma, glioblastoma multiforme, cerebellar haemangioblastoma, meningioma, Schwannoma of 7<sup>th</sup> cranial nerve. Gliomas constitute fifty percent of the brain tumours and sixty percent of all gliomas are glioblastoma multiforme. Meningiomas constitute twenty percent and cerebral metastasis is seen in fifteen percent of the cases. Seventy percent of supratentorial tumours are found in adults and seventy percent of brain tumours in children are infratentorial. The three common tumours of cerebellum are medulloblastoma, haemangioblastoma and juvenile pilocytic astrocytoma. Brain tumours are space occupying lesions and cause compression and destruction of adjacent structures, brain oedema (Peritumoural tissue), infarction and ischaemia of brain by compressing/infiltrating cerebral blood vessels, obstruction of CSF flow causing hydrocephalus, and rise in intracranial pressure with herniations. Tumours can undergo ischaemic necrosis and necrotic tumours tend to bleed. Brain tumours generally do not metastasise. Schwannoma and meningioma are benign tumours. Medulloblastoma of childhood may have drop metastasis via CSF. A sincere effort has been put in this study to identify the incidence of each variety of brain tumour among the fifty confirmed and identified cases of brain tumours.

#### METHODS

The age range of the cases in present study was 5-72 years with a mean age of occurrence of 44.11 years and the peak age group affected were in the 3<sup>rd</sup> and 4<sup>th</sup> decades. Cerebral hemisphere was the commonest site for intracranial tumours.

#### RESULT

In the present study, fifty six percent of the cases were of neuroepithelial in origin. Twenty eight percent were meningiomas. Only one case was metastatic in origin and in two patients the pituitary adenomas were confirmed. The study is in agreement with the other studies when compared.

#### CONCLUSION

Cerebrum was the commonest site of intracranial tumours. Neuroepithelial tumours were the most common histological type followed by pituitary tumours and meningiomas. Majority of malignant intracranial tumours were WHO grade I. Rare variant like clear cell type was also observed. Most meningiomas were of grade I, but most astrocytomas were of higher grade.

#### KEYWORDS

Brain, Tumour, Histopathology, Neoplasm, Meningioma.

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**INTRODUCTION:** Brain neoplasms occur at all ages and account for around 2-3 percent of all deaths in adults. In children, the frequency increases to more than twenty percent. In children, it forms the second most common type of malignancy. Most of the tumours encountered are not related to any identifiable risk factors except for irradiation and some hereditary syndromes like subependymal giant cell

astrocytoma, glioblastoma multiforme, cerebellar haemangioblastoma, meningioma, Schwannoma of 7<sup>th</sup> cranial nerve. Gliomas constitute fifty percent brain tumours and sixty percent of all gliomas are glioblastoma multiforme. Meningiomas constitute twenty percent and cerebral metastasis is seen in fifteen percent of the cases. Radiologist and "Pathologists" share many common traits and our subspecialties have in many ways evolved in parallel. Serial computed tomography reconstruction techniques permit the radiation of 3-dimensional images that can be rotated to provide the radiologist, surgeon, and pathologist with a detailed view of the relationship of the detailed bony features of the skull and spine with the vasculature and the anatomic alterations in them arising secondary to tumour or other pathologic processes.

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Brain tumours are named according to the cell of origin, e.g. astrocytoma from astrocytes and glioblastoma multiforme from glioblasts; oligodendroglial cells - oligodendroglioma; ependymal cells - ependymoma; choroid plexus cells - choroid papilloma; neuronal precursor cells - medulloblastoma; meningeal arachnoid cells - meningioma; vascular cells- haemangioblastoma; Schwann cells- Schwannoma; embryonic remnant - craniopharyngioma. Seventy percent of supratentorial tumours are found in adults and seventy percent of brain tumours in children are infratentorial. The three common tumours of cerebellum are medulloblastoma, haemangioblastoma, and juvenile pilocytic astrocytoma. Brain tumours are space occupying lesions and cause compression and destruction of adjacent structures, brain oedema (Peritumoral tissue), infarction and ischaemia of brain by compressing/infiltrating cerebral blood vessels, obstruction of CSF flow causing hydrocephalus and rise in intracranial pressure with herniations. Tumours can undergo ischaemic necrosis and necrotic tumours tend to bleed. Brain tumours generally do not metastasise. Schwannoma and meningioma are benign tumours. Medulloblastoma of childhood may have drop metastasis via CSF.

Astrocytic tumours are composed of astrocytes represent the largest, most complex, and most diverse group of neuroectodermal tumours whose morphologic and biologic characteristics vary according to location and age and from case to case.<sup>1</sup>

Studies from Taipei in Taiwan by Wong T.T. et al. on Primary Paediatric Brain Tumours showed incidence of pilocytic astrocytoma accounting for 13.28%.<sup>2</sup> etc. No clear gender predilection is seen.<sup>3</sup> Pilocytic astrocytoma is the most common glioma in children in whom the majority [67%] arise in the cerebellum.<sup>4</sup> Age incidence ranges from 15-30 years.<sup>5</sup> Diffuse astrocytoma occurs in young and is composed of well-differentiated astrocytes infiltrating the surrounding brain. The tumour has tendency to transform to anaplastic form or glioblastoma multiforme.

Glioblastoma multiforme is one of the most malignant and can be primary or may develop from progression of diffuse astrocytoma. It can invade opposite hemisphere (butterfly lesions). There is necrosis, haemorrhage, and cystic changes with marked microscopic pleomorphism and vascular proliferation. Pilocytic astrocytoma is common in children and this is cystic and well circumscribed i.e. usually well within the location composed of fibrillar astrocytes often showing Rosenthal fibers. Oligodendroglioma are found on cerebral hemispheres and are circumscribed and calcified in most of the cases. It is composed of uniform oligodendroglia cells with low mitotic rate. It tends to relapse after surgery. Medulloblastoma is a childhood tumour. The tumour is extremely rare and never seen after fourth decade of life. The tumour involves vermis of cerebellum in children. Histologically, it is composed of densely packed "small blue cells" arranged into solid sheets with frequent mitosis and necrosis. Ependymoma arises from the ependymal cell that lines the ventricle and the spinal canal. In brain, sixty percent of tumours originate in the fourth ventricle and in

spinal cord it may originate from filum terminale. Histologically, it is composed of ependymal cells forming perivascular pseudorosettes and tubules.

**AIMS AND OBJECTIVES:**

1. To study the histopathology of brain tumours.
2. To study the incidence of different brain tumours among the sample study.

**MATERIALS AND METHODS:** The study was conducted in Fathima Medical College, Kadapa. Fifty cases of brain tumours were identified and this was the sample size to be studied. The study was conducted from the month of January 2012 to December 2015.

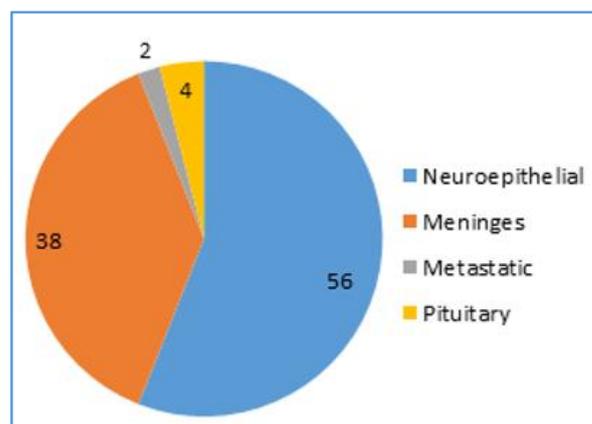
The age range of the cases in present study was 5-72 years with a mean age of occurrence of 44.11 years and the peak age group affected were in the 3<sup>rd</sup> and 4<sup>th</sup> decades. Cerebral hemisphere was the commonest site for intracranial tumours.

Complete clinical history and clinical diagnosis were noted down in all the cases. All the specimens were from biopsy of operated tumours received in 10% formalin. They were processed by the routine paraffin embedding technique. All the tissue bits that were received were embedded wherever necessary in multiple paraffin blocks and sections from all these blocks were studied. Paraffin sections of 4 microns thickness were obtained from each block and stained with haematoxylin and eosin stain using standard procedures. Histochemical stains were performed wherever indicated.

**RESULTS:**

Types of tumour	No. of cases	Percentage
Neuroepithelial tumours	28	56
Tumours of meninges	19	38
Metastatic tumours	1	2
Pituitary gland tumours	2	4
<b>Total</b>	<b>50</b>	<b>100</b>

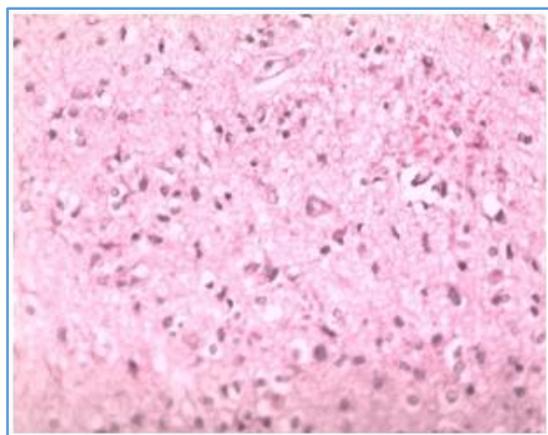
**Table 1: Showing the Incidence of Each Type of Tumours in the Sample Study**



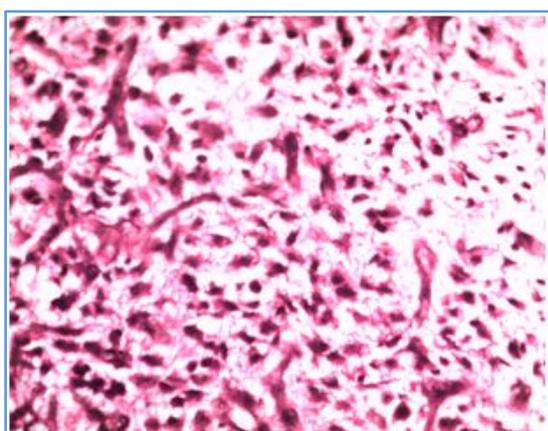
**Fig. 1: Showing the Incidence of Each Type of Tumour**

Histological types	Cases
Astrocytic tumours	22
Oligodendroglial tumours	1
Oligoastrocytic tumours	4
Embryonal tumours	1
<b>Total</b>	<b>28</b>

**Table 2: Incidence of Types of Neuroepithelial Tumours**



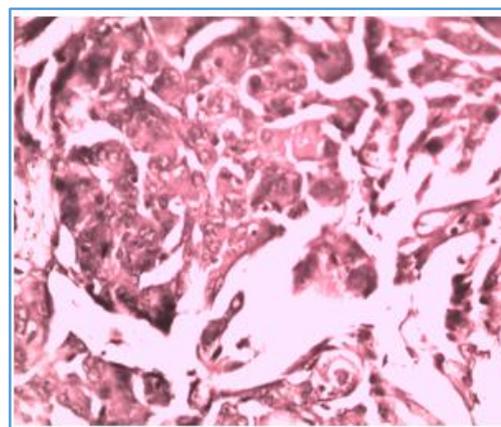
**Fig. 2: Microphotograph of Fibroblastic Astrocytoma. Moderately Cellular Tumour Composed of Fibrillary Astrocytes with Moderate Pleomorphism. Background is Fibrillary**



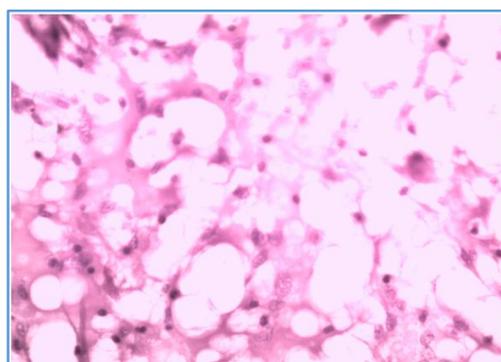
**Fig. 3: Microphotograph of Oligodendrocytoma Grade II. Two Distinct Components Displaying Oligodendroglial with Chickenwire Pattern of Blood Vessel on the Left and Astrocytic with Fibroblastic Background on the Right**

Variants	No. of cases
Meningothelial	15
Fibroblastic	1
Transitional	1
Lipomatous	1
Clear cell	1
<b>Total</b>	<b>19</b>

**Table 3: Incidence of Meningioma**



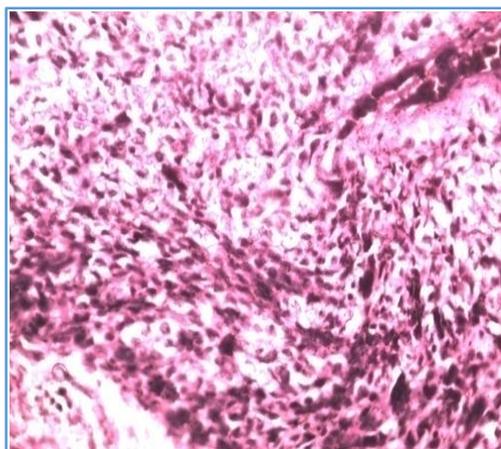
**Fig. 4: Microphotograph of Atypical Meningioma. Increased Cellularity, Small Cells with High n:c Ratio, Prominent Nucleoli and Sheet-Like Growth Pattern**



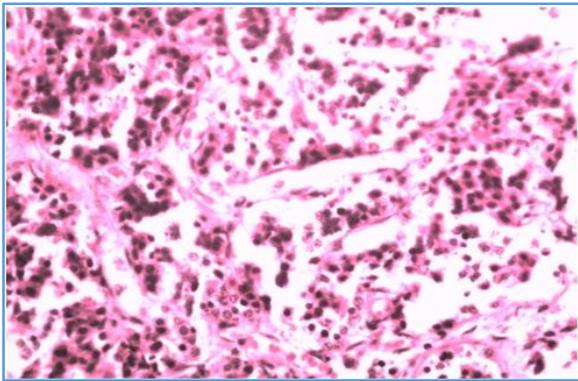
**Fig. 5: Microphotograph of Lipomatous Meningioma. Meningothelial Cells with Fat Accumulation in the Cytoplasm**

Type of tumour	
Neurofibrosarcoma	1
<b>Total</b>	<b>1</b>

**Table 4: Showing Distribution of Metastatic Tumours**



**Fig. 6: Microphotograph of Metastasis from Neurofibrosarcoma. Wavy Spindle-Shaped Cells with hyperchromatic Pleomorphic Nuclei Arranged in Interlacing Bundles**



**Fig. 7: Microphotograph of Pituitary Adenoma-Acidophilic Type. Tumour Cells with Acidophilic Granular Cytoplasm**

**DISCUSSION:** In the present study in fifty six percent of the cases were of neuroepithelial in origin. Twenty eight percent were meningiomas. Only one case was metastatic in origin and in two patients the pituitary adenomas were confirmed.

Meningiomas are common in women, peak age being fifty to seventy years. Meningiomas account for about 24-30% of primary intracranial tumours occurring in the USA<sup>6</sup> with an annual incidence rate of up to 13 per 10,000 populations in Italy.<sup>7</sup> Many small meningiomas are asymptomatic incidental neuroimaging findings. In Scandinavia, the incidence has increased between 1968 and 1997 from 2.6 to 4.5 per 100,000 in women and from 1.4 to 1.9 in men.<sup>8</sup>

They are located most often in parasagittal position and along the falx cerebri. They are well circumscribed compressing the brain from outside. The overlying bone shows hyperostosis. The tumour also shows local infiltration. Histologically, it is composed of meningotheial cells forming whorls often with central calcification (psammoma bodies). In these diseases, the prognosis is excellent and it usually depends on grade of the tumour. Grade 1 tumour has excellent prognosis, but recur in ten percent cases; Grade 2 tumours tend to recur in thirty percent cases. Grade 3 invades the brain and is lethal.

Cerebellar haemangioblastoma is benign and is composed of endothelial cells forming small blood vessels. Craniopharyngioma is also a benign tumour arising from remnants of Rathke's pouch, the primordium of the pituitary. It is located in suprasellar region and tends to compress and destroy the hypothalamus. Metastatic tumours to brain are commonly from the breast, lung, colon, thyroid, kidney, and malignant melanoma.

A sincere effort has been put in this study to identify the incidence of each variety of brain tumour among the fifty confirmed and identified cases of brain tumours.

It is quite evident that neuroepithelial tumours are the most common of all tumours followed by meningiomas and cranial nerve tumours followed by pituitary tumours in all studies. The craniopharyngiomas were least in order of frequency. The incidence of craniopharyngiomas was higher in Katsura et al.<sup>9</sup> study compared to other study and was least in study done by Banerjee et al.<sup>10</sup>

It is to be documented that in this study all the major findings were approximately similar to those in other studies. In this prospective, clinicopathological study of 50 cases of intracranial tumours we arrived at the following result.

The present study systematically analyses 50 cases of intracranial tumours over a period of two years. The geographic distribution of cases were found to be 50 cases from Kadapa district.

The age range of the cases in present study was 5-72 years with a mean age of occurrence of 44.11 years and the peak age group affected were in the 3<sup>rd</sup> and 4<sup>th</sup> decades. Cerebral hemisphere was the commonest site for intracranial tumours. This site incidence correlates with that of Verma et al.<sup>11</sup> study.

Neuroepithelial tumours were the commonest histological type accounting for 56% of located in cerebral hemisphere. The percentage incidence and location of neuroepithelial tumours were similar to that of other studies by India and abroad. Within the neuroepithelial tumours, astrocytic tumours formed the largest group. Most astrocytomas were of higher grade location being cerebral hemisphere. Incidence is similar to other studies. Meningeal tumours formed the next 19 cases (38%) of tumours. Incidence and the location of meningiomas were similar to other studies.<sup>11,12,13</sup>

Pituitary tumours accounts for 4 percent of all the intracranial tumours with an average age incidence of 37.7 years resembling the study by Verma et al.<sup>11</sup>

**CONCLUSION:** Cerebrum was the commonest site of intracranial tumours. Neuroepithelial tumours were the most common histological type followed by pituitary tumours and meningiomas. Majority of malignant intracranial tumours were WHO grade I. Rare variant like clear cell type was also observed. Most meningiomas were of grade I, but most astrocytomas were of higher grade. There is a lot of future for this study. The scope is increasing day by day. The incidence is growing higher and higher. The use of different devices that has high electromagnetic radiation is blamed. The mobile phones might be the reason in increasing the incidences of meningiomas.

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