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Original Article

Pathology Section

Trends of Central Nervous System Tumours and their Histological Subtypes in a Tertiary Care Centre in Southern India

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ABSTRACT

Introduction: Study of Central Nervous System (CNS) tumours is quite interesting for the varied spectrum we come across and the significant morbidity they cause. They constitute 2% of all adult malignancies but there is 20% of childhood malignancies. Even though there is bimodal age peaks in the incidence, paediatric age group CNS tumours are quite different biologically and histologically from adult brain tumours. Some of the brain tumours have a dismal prognosis while some have good outcome depending on the extent of removal.

Aim: To study the trend of the incidence of various CNS tumours and their histological subtypes at ESIC Sanathnagar, Hyderabad, India over a period of seven years.

Materials and Methods: The present study is a retrospective descriptive analysis of CNS specimens received at the Department of Pathology, ESIC Superspeciality Hospital, Sanathnagar over a period of seven years which were confirmed on Histopathological Examination (HPE) as CNS tumours. This article is a study of CNS tumours, their trends in incidence in accordance with their age, sex, clinical presentation, and site of occurrence. The specimens were formalin fixed, underwent routine automatic tissue processing, paraffin embedded and Haematoxylin and Eosin (H&E) staining was done. Immunohistochemistry, special stains were done when necessary. Reporting was done according to the prevailing World Health Organisation (WHO) classification system of tumours of the CNS (2007/2016). The results were analysed using percentages and mean scores.

Results: In this study, gliomas, meningiomas and schwannomas were the most common groups with higher incidence in males in the age group of 40-50 years. The frontal lobe was most commonly involved.

Conclusion: In this study, an emphasis was laid on the variety of CNS tumours that are generally encountered, their age and gender distribution. Histopathological confirmation seems to be the gold standard and is an essential preliminary step for management.

Keywords: Brain tumours, Gliomas, Incidence, Meningiomas, Retrospective

INTRODUCTION

The term CNS tumours generally comprises of tumours of the brain and spinal cord, meninges, pituitary gland, pineal gland and nerves. CNS tumours are a group of uncommon heterogenous tumours of varied histopathological features. There are around 100 histological varieties that occur in the CNS. They constitute less than 2% of all tumours [1]. However, the incidence of CNS tumours is increasing in the recent decades. Studies have documented an increase in both males and females in India. The reason for such a trend is probably due to improved access to medical care as well as improved diagnostic modalities. Studies in developed countries have showed an increase in higher grade tumours and a decline in lower grade tumours [2]. Various risk factors have been attributed as the cause of CNS tumours like genetic predisposition and exposure to high doses of ionising radiation. The role of infections and immune factors needs further research. These tumours can be benign or malignant. Sometimes, even the benign tumours of CNS cause significant morbidity because of the location, size and local infiltration [3]. The age of presentation is bimodal with peaks in the childhood and adult age group of 40-70 years of age. CNS tumours constitute 20% of childhood brain tumours. Childhood CNS tumours form a distinct biological entity because of their unique presentation and molecular biology and survival rates are higher than in adults. A 70% of childhood primary brain tumours preferentially involve the infratentorial region [4]. The tumours in adults are predominantly supratentorial arising in the frontal, temporal and parietal lobes. A higher incidence of CNS tumours is noted in males except in meningiomas where females are the majority.

As already mentioned, CNS tumours constitute a complex group including astrocytomas, glioblastomas, oligodendrogliomas, ependymomas, meningiomas etc. Radiological diagnostic techniques like Computed Tomography (CT), Magnetic Resonance Imaging (MRI) along with stereotactic biopsy from multiple sites and, intraoperative squash smear, guide the neurosurgeon to plan the extent of surgery [5]. Despite their rare occurrence, CNS tumours have poor survival for many tumour types compared to other cancers. A general awareness of trends of CNS tumours is required for better diagnosis and treatment.

In this context, CNS tumours were studied with the objective of knowing their trends of incidence with respect to age, sex, site and histopathological subtypes in a Tertiary Care Centre in southern India.

MATERIALS AND METHODS

The present study was a retrospective descriptive analysis of data from the records at the Department of Pathology in collaboration with the Department of Neurosurgery, ESIC Superspeciality Hospital, Sanathnagar, Hyderabad, India. The period of study was from January 2013 to December 2019 (a period of seven years). The age, sex and clinical presentation of all the cases were systematically noted. Institutional Ethical Committee clearance was obtained (IEC No.-99/U/IEC/ESICMC/F0 204/08-2020).

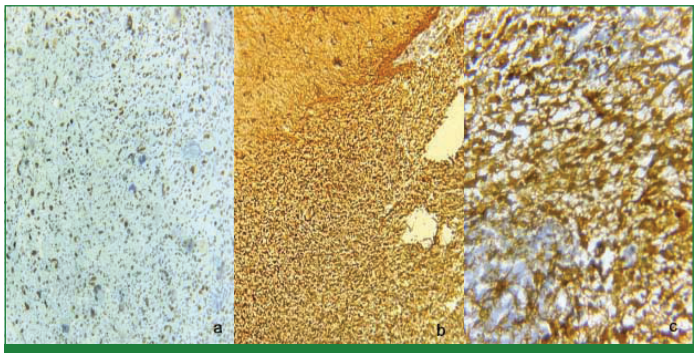
Inclusion criteria: All the cases which were histopathologically proven to be CNS tumours were included in the study. All age groups were included.

Exclusion criteria: Inadequate biopsy samples and cases with

incomplete data were excluded. All non-tumour and inflammatory lesions found on HPE were excluded from the study. All recurrent lesions were excluded.

Majority of the cases had squash cytology and frozen section was used where necessary. Both rapid H&E and toluidine blue stains were used for squash cytology. Squash was done to the cases requested by the neurosurgeon whenever necessary (as in diagnostic and theraptic dilemma). There was no discrepancy between squash and histopathology findings.

The specimens which were received for HPE were fixed in 10% neutral buffered formalin. Routine tissue processing with paraffin embedding was done. H&E stain was used for staining. Immunohistochemistry was used whereever required. Diagnosis and grading of the tumours was given according to WHO Classification of CNS tumours (2007/2016) [6,7]. According to the WHO 2016 classification [7], molecular parameters were included in the diagnosis. But, since at our institution molecular testing was not available, diagnosis was based on histopathology and immunohistochemistry. Immunohistochemistry was done routinely with Envision detection kit from DAKO, primary antibodies from DAKO and DAB as chromogen. Antigen retrieval was done using heat induced method through microwave oven. For immunohistochemistry the following monoclonal and polyclonal antibodies were used. Glial Fibrillary Acidic Protein (GFAP), synaptophysin, S100, Leucocyte Common Antigen (LCA), Epithelial Membrane Antigen (EMA) and vimentin [Table/Fig-1]. An extended panel was used for metastatic tumours. As per the categories in the WHO classification 2016 [7], the tumours were divided into tumours of neuroepithelial tissue, tumours of meninges, tumours of cranial and paraspinal nerves, lymphomas and hematopoietic neoplasms, germ cell tumours, tumours of the sellar region and metastatic tumours.



[Table/Fig-1]: a) Immunohistochemistry p53 nuclear positivity 100x Glioblastoma multiforme. b) Immunohistochemistry glial fibrillary acidic protein positivity 100x Astrocytoma. c) Immunohistochemistry S 100 nuclear and cytoplasmic positivity 400x Schwanomma.

STATISTICAL ANALYSIS

The results were collected from the old records and statistical analysis was done as percentages and mean scores.

RESULTS

The study involved CNS tumours which were analysed over a period of seven years from January 2013 to December 2019 at the Department of Pathology, ESIC Superspecialty Hospital, Sanath Nagar, Hyderabad in collaboration with Department of Neurosurgery.

The distribution of various CNS tumours in the last seven years show a similar trend of neuroglial tumours, meningiomas and forming the two largest groups in every year. Largest number of cases were recorded in the year 2017 accounting to 24.8% with 44 cases out of the total 177 cases [Table/Fig-2]. A total of 177 cases were studied. Gender wise distribution shows 93 were male patients and 84 were female patients [Table/Fig 3]. Male to female ratio was 1.1:1. Among neuroglial tumours - Diffuse astrocytomas, pilocytic astrocytoma, gemistocytic astrocytoma, pleomorphic xanthoastrocytoma, anaplastic astrocytoma, anaplastic oligodendroglioma, glioblastoma, myxopapillary ependymoma, small cell glioblastoma, choroid plexus papilloma were more commom in males. Metastatic deposits were more common in males. Neuroglial tumours -Fibrillary Astrocytoma, Oligoastrocytoma, Oligodendroglioma, Ependymoma, Tanycytic Ependymoma were common in females and Schwannomas and meningiomas were also common in females [Table/Fig-3]. There was a wide range of age distribution. The youngest patient was 3-year-old and the eldest patient was 78-year-old. The mean age

	2013	2014	2015	2016	2017	2018	2019
Meningeal Tumours (54)	5	7	4	6	12	10	10
Neuroglial Tumours (57)	3	6	8	7	14	10	9
Neuronal Tumours (4)	0	0	0	0	0	3	1
Tumours of Sella (5)	0	0	0	0	1	1	3
Embryonal Tumours (2)	0	0	0	0	1	0	1
Germ Cell Tumours (1)	0	0	0	0	1	0	0
Tumours of Peripheral Nerves (37)	1	0	4	5	9	10	8
Mesenchymal Tumours (2)	0	0	0	0	0	0	2
Metastasis (15)	2	1	0	0	6	5	1
Total	11	14	16	18	44	39	35

[Table/Fig-2]: Seven year distribution of CNS tumours.

Type of Tumour	Male	Female	Total
Schwannoma	14	21	35
Meningioma	22	32	54
Diffuse Astrocytoma	9	0	9
Fibrillary Astrocytoma	0	2	2
Gemistocytic Astrocytoma	1	0	1
Pilocytic Astrocytoma	3	2	5
Anaplastic Astrocytoma	6	1	7
Oligoastrocytoma	2	4	6
Pleomorphic Xanthoastrocytoma	2	0	2
Small Cell Glioblastoma	1	0	1
Angiocentric Glioma	0	1	1
GBM	12	5	17
Oligodendroglioma	0	1	1
Anaplastic Oligodendroglioma	1	0	1
Ependymoma	0	1	1
Tanycytic Ependymoma	0	1	1
Myxopapillary Ependymoma	1	0	1
Medulloblastoma	1	0	1
Desmoblastic Medulloblastoma	0	1	1
Ganglioglioma	1	0	1
Dysplastic	0	1	1
Craniopharyngioma	2	0	2
Pitutary Adenoma	1	2	3
Neurocytoma	1	1	2
Solitary Fibrous Tumour	0	2	2
Choroid Plexus Papilloma	1	0	1
Germinoma	1	0	1
Neurofibroma	2	0	2
Metastasis	9	6	15
Total	93 (52.5%)	84 (47.5%)	177

[Table/Fig-3]: Gender wise distribution of different CNS tumours.

Type of Tumour	1-10 y	11-20 y	21-30 y	31-40 y	41-50 y	51-60 y	61-70 y	71-80 y
Meningiomas	-	1 (1.8%)	4 (7.4%)	5 (9.2%)	18 (33.3%)	14 (25.9%)	10 (18.5%)	2 (3.7%)
Diffuse Astrocytomas	-	-	3 (33.3%)	3 (33.3%)	2 (22.2%)	1 (11.1%)	-	-
Pilocytic Astrocytoma	1 (20%)	3 (60%)	-	1 (20%)	-	-	-	-
Fibrillary Astrocytoma	-	-	-	2 (100%)	-	-	-	-
Gemistocytic Astrocytoma	-	-	1 (100%)	-	-	-	-	-
Pleomorphic Xanthoastrocytoma	-	-	-	-	-	-	2 (100%)	-
Anaplastic Astrocytoma	-	-	-	1 (14.2%)	2 (28.6%)	3 (42.8%)	1 (14.3%)	-
Oligodendroglioma	-	-	-	1 (100%)	-	-	-	-
Anaplastic Oligodendroglioma	-	-	-	-	1 (100%)	-	-	-
Glioblastoma Multiforme	-	-	2 (11.8%)	2 (11.8%)	7 (41.17%)	3 (17.4%)	2 (11.8%)	1 (5.9%)
Oligoastrocytoma	-	-	-	1 (16.6%)	3 (50%)	2 (33.3%)	-	-
Ependymoma	-	-	1 (100%)	-	-	-	-	-
Tanycytic Ependymoma	-	-	-	-	1 (100%)	-	-	-
Myxopapillary Ependymoma	1 (100%)	-	-	-	-	-	-	-
Angiocentric Glioma	1 (100%)	-	-	-	-	-	-	-
Smallcell Glioblastoma	-	-	-	-	1 (100%)	-	-	-
Choroid Plexus Papilloma	1 (100%)	-	-	-	-	-	-	-
Ganglioglioma				1 (100%)				
Dysplastic Gangliocytoma of Cerebellum	-	-	1 (100%)	-	-	-	-	-
Neurocytoma	-	-	-	2 (100%)	-	-	-	-
Pitutary Adenoma	-	1 (33.3%)	-	1 (33.3%)	-	1 (33.3%)	-	-
Cranipharyngioma	-	-	-	1 (50%)	1 (50%)	-	-	-
Medulloblastoma	-	1 (100%)	-	-	-	-	-	-
Desmoblastic Medulloblastoma	-	1 (100%)	-	-	-	-	-	-
Germinoma	-	-	1 (100%)	-	-	-	-	-
Schwannoma	-	1 (2.85%)	4 (11.4%)	11 (31.4%)	6 (17.1%)	13 (37.1%)	-	-
Neurofibroma	-	-	-	1 (50%)	-	1 (50%)	-	-
Solitary Fibrous Tumour	-	-	-	1 (50%)	-	1 (50%)	-	-
Metastasis	-	-	1 (6.6%)	2 (13.3%)	4 (20%)	5 (40%)	3 (20%)	-
Total	4 (2.2%)	8 (4.4%)	18 (10.2%)	36 (20.4%)	46 (25.9%)	44 (24.8%)	18 (10.2%)	3 (1.7%)

[Table/Fig-4]: Age wise distribution of various CNS tumours.

of presentation was 40.5 years. The highest number of cases was seen in the age group of 41-50 years [Table/Fig-4].

Of the 177 cases of CNS tumours, 138 were in the brain and 39 were in the spinal location. The most common site site of involvement in the brain was the frontal lobe with 59 cases involving the frontal area [Table/Fig-5]. The second common site involved was parietal lobe with 31 cases. Some of the tumours like pilocytic astrocytoma, dysplastic gangliocytoma of cerebellum, medulloblastoma were seen in the cerebellum. Thus, 33.3% were seen in the frontal lobe, 11.3% were seen in the temporal lobe, 17.2% were seen in the parietal lobe and 5.6% in the cerebellum. Occipital lobe was not involved in present study.

Among the paediatric age group (<15 years), 10 cases were seen, of which 2 cases had spinal cord involvement and 8 cases in the intracranial location. The youngest age presentation was three years diagnosed for choroid plexus papilloma. Other tumours include 3 cases of pilocytic astrocytoma, one case each of medulloblastoma, germinoma, myxopapillary ependymoma, Peripheral Neuroectodermal Tumour (PNET) and angiocentric glioma.

Of the 177 cases of CNS tumours 57 cases (32.2%) were of neuroglial origin. The second most common group were the meningiomas constituting 54 cases (30.5%), next frequent groups being schwannomas and metastatic deposits [Table/Fig-6].

Of the 57 cases of neuroglial tumours. Eight cases were of WHO grade 1, 23 of grade 2, eight of grade 3 and 18 were of grade 4. Thus, glioblastomas were the most common tumour in the neuroglial category. In the neuroglial tumours, the predominant age group involved was 41-50 years. There were 39 male patients and 18 female patients. Neuroglial tumours mostly involved the frontal lobe of the brain. Only ependymomas were seen in the spinal location. Of the 57 cases, only 3 cases involved the cerebellum.

Out of the 54 cases of meningiomas, 42 were meningotheliomatous meningiomas, seven cases of atypical meningiomas. One case of psammomatous meningioma, two cases of angiomatous meningioma, two cases of malignant meningiomas were seen. A total of 22 cases were seen in males and 32 were seen in the females. Thus, meningiomas were more common in the females in contrast to other CNS tumours. Meningiomas' 18 cases (33.33%) were seen in 41-50 years of age group [Table/Fig-7]. Meningiomas preferably involved the frontal and parietal lobes. Spinal region was also involved in six cases. However, cerebellum was a rare site and no cases were seen in the occipital lobe.

Schwannomas were more common in females with 21 cases when compared to males and the most common age involed was 51-60 years. Total of 21 cases (60%) were seen in the spinal cord. The other sites of presentation were cerebellopontine angle with nine cases and vestibular location with five cases. Out of 35 cases of schwannoma, only two cases of ancient schwannoma was found.

Out of the 15 cases of metastatic deposits, there were four cases of colonic carcinoma deposits, five of breast carcinoma deposits, one case each of renal cell carcinoma deposit, neuroendocrine deposit and Non Hodgkins lymphoma deposit, and two were poorly differentiated carcinoma from lung and one case of sarcoma

Type of Tumour	Spinal	Vestibular	CP Angle	Frontal	Temporal	Parietal	Tentorial	Supracellar	Cerebellum
Meningiomas	6 (11.1%)	-	-	21 (38.8%)	9 (16.6%)	16 (29.6%)	-	-	2 (3.7%)
Diffuse Astrocytomas	-	-	-	7 (77.7%)	-	2 (22.2%)	-	-	-
Pilocytic Astrocytoma	-	-	-	2 (40%)	-	1 (20%)	-	-	2 (40%)
Fibrillary Astrocytoma	-	-	-	-	-	1 (50%)	-	-	1 (50%)
Gemistocytic Astrocytoma	-	-	-	1 (100%)	-	-	-	-	-
Pleomorphic Xanthoastrocytoma	-	-	-	2 (100%)	-	-	-	-	-
Anaplastic Astrocytoma	-	-	-	5 (71.4%)	1 (14.2%)	1 (14.2%)	-	--	-
Oligodendroglioma	-	-	-	1 (100%)	-	-	-	-	-
Anaplastic Oligodendroglioma	-	-	-	-	-	-	1 (100%)	-	-
Glioblastoma Multiforme	-	-	-	10 (58.8%)	3 (17.6%)	4 (23.5%)	-	-	-
Oligoastrocytoma	-	-	-	4 (66.6%)	-	2 (33.3%)	-	-	-
Ependymoma	1 (100%)	-	-	-	-	-	-	-	-
Tanycytic Ependymoma	1 (100%)	-	-	-	-	-	--	--	-
Myxopapillary Ependymoma	1 (100%)	-	-	-	-	-	-	-	
Angiocentric Glioma	-	-	-	1 (100%)	-	-	-	-	-
Small cell Glioblastoma	-	-	-	-	1 (100%)	-	-	-	-
Choroid Plexus Papilloma	-	-	-	-	-	-	-	-	1 (100%)
Ganglioglioma	-	-	-	-	-	1 (100%)	-	-	-
Dysplastic Gangliocytoma of Cerebellum	-	-	-	-	-	-	-	-	1 (100%)
Neurocytoma	-	-	-	1 (50%)	1 (50%)	-	-	-	-
Pitutary Adenoma	-	-	-	1 (33.3%)	2 (66.6%)	-	-	-	-
Cranipharyngioma	-	-	-	-	-	-	-	2 (100%)	-
Medulloblastoma	-	-	-	-	-	-	-	-	1 (100%)
Desmoblastic Medulloblastoma	-	-	-	-	-	-	-	-	1 (100%)
Germinoma	-	-	-	-	-	-	-	1 (100%)	-
Schwannoma	21 (60%)	5 (14.2%)	9 (25.7%)	-	-	-	-	-	-
Neurofibroma	2 (100%)	-	-	-	-	-	-	-	-
Solitary Fibrous Tumour	1 (100%)	-	-	-	-	-	-	-	--
Metastasis	5 (33.3%)	-	-	3 (20%)	3 (20%)	3 (20%)	-	-	1 (6.6%)
Total	39 (21.4%)	5 (2.82%)	9 (5.1)%)	59 (33.3%)	20 (11.3%)	31 (17.2%)	1 (0.56%)	3 (1.69%)	10 (5.6%)

[Table/Fig-5]: Age wise distribution of various CNS tumours.

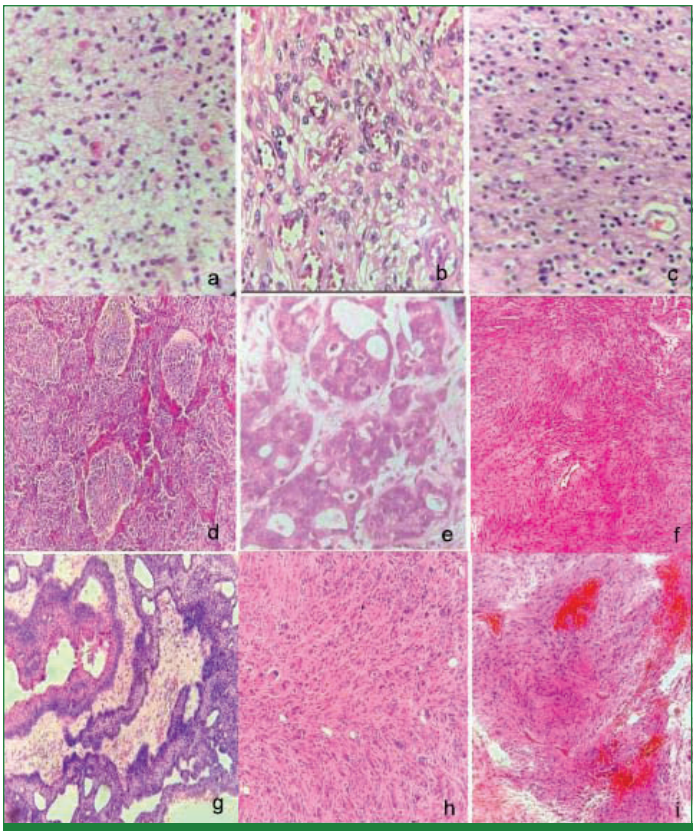
Type of Tumour	No. of cases	Percentage
Meningiomas (54 cases)		
Meningothelial Meningioma	42	23.70%
Atypical Meningioma	7	3.95%
Angiomatous Meningioma	2	1.12%
Malignant Meningioma	2	1.12%
Psammomatous Meningioma	1	0.57%
Neuroglial Tumours (57 Cases)		
Diffuse Astrocytomas	9	5.08%
Pilocytic Astrocytoma	5	2.82%
Fibrillary Astrocytoma	2	1.12%
Gemistocytic Astrocytoma	1	0.56%
Pleomorphic Xanthoastrocytoma	2	1.12%
Anaplastic Astrocytoma	7	3.95%
Oligodendroglioma	1	0.57%
Anaplastic Oligodendroglioma	1	0.57%
Glioblastoma Multiforme	17	9.60%
Oligoastrocytoma	6	3.38%
Ependymoma	1	0.57%
Tanycytic Ependymoma	1	0.57%
Myxopapillary Ependymoma	1	0.57%
Angiocentric Glioma	1	0.57%
Small Cell Glioblastoma	1	0.57%
Choroid Plexus Papilloma	1	0.57%
Neuronal Tumours (4 Cases)		
Ganglioglioma	1	0.57%
Dysplastic Gangliocytoma of Cerebellum	1	0.57%
Neurocytoma	2	1.12%
Tumours of the Sellar (5 Cases)		
Pitutary Adenoma	3	1.69%
Cranipharyngioma	2	1.12%
Embryonal Tumours (2 Cases)		
Medulloblastoma	1	0.57%
Desmoblastic Medulloblastoma	1	0.57%
Germ Cell Tumours (1 Case)		
Germinoma	1	0.57%
Tumours of the Peripheral Nerves (37 Cases)		
Schwannoma	35	19.7%
Neurofibroma	2	1.12%
Mesenchymal Tumours (2 Cases)		
Solitary Fibrous Tumour	2	1.12%
Metastasis (15 cases)	15	8.47%
Total	177	100%

[Table/Fig-6]: Spectrum of CNS tumours.

deposit. Metastatic deposits predominantly involved males (9 cases). They were mostly seen in 51-60 years of age. Metastasis involved both brain (10 cases) and spinal cord (5 cases). In the brain they predominantly involved the supratentorial region. H&E

Type of Tumour	1-10 y	11-20 y	21-30 y	31-40 y	41-50 y	51-60 y	61-70 y	71-80 y
Meningothelial Meningioma	-	-	3 (7.2%)	4 (9.6%)	15 (36%)	12 (28.8%)	7 (16.8%)	1(2.4%)
Atypical Meningioma	-	-	-	1 (14.2%)	2 (28.4%)	2 (28.4%)	2 (28.4%)	-
Angiomatous Meningioma	-	1 (50%)	-	-	-	-	--	1 (50%)
Malignant Meningioma	-	-	1 (50%)	-	1 (50%)	-	-	-
Psammomatous Meningioma	-	-	-	-	-	-	1 (100%)	-

[Table/Fig-7]: Age wise distribution of various meningiomas.



[Table/Fig-8]: a) Oligoastrocytoma areas showing two distinct components of cells with oligodendroglial and astrocytic features (H&E 400x). b)Angiomatous meningioma. Plenty of blood vessels admixed with meningothelial cells (H&E 400x). c) Diffuse astrocytoma moderate cellularity with sheets of neoplatic astrocytes (H&E 400x). d) Desmoplastic medulloblastoma nodular architecture with reticulin rich and reticulin poor areas (H&E 400x). e) Adenocarcinoma deposit cells arranged in glandular pattern within fibrillary background (H&E 400x). f) Schwannoma areas of Antony A and Antony B patterns (H&E 400x). g) Craniopharygioma sections show multilayered epithelium surrounding a stellate reticulum (H&E 400x). h) Glioblastoma multiforme sections show sheets of pleomorphic glial cells with bizarre nuclei (H&E100x). i) Tanycytic ependymoma Sections show spindle cells with long bipolar processes (H&E 400x).

staining images of few of CNS tumours are shown in [Table/Fig-8].

DISCUSSION

The CNS tumours are rare and account to less than 2% of all malignancies [8]. They constitute around 1.9% of all tumours in India. The peak age of distribution was observed between 41 to 50 years of age which was in concordance with Thambi R et al., Yadav N et al., Zalata KR et al., which showed 26.8%, 27.2% and 20.6%, respectively [1,9,10]. The present study showed 46 (25.9%) of cases in that age group. The male is to female ratio in the present study was 1.1:1 which was in concordance with Mondal S et al., and Yadav N et al., [4,9].

Schwannomas and meningiomas were more common in the females similar to Zalata KR et al., [10]. Among the CNS tumours astrocytomas were the most common group constituting 31.6% in the present study similar to Lee CH et al., and Kumarguru BN et al., which showed 56.2% and 29.25%, respectively [11,12]. Of the astrocytomas, the most common was glioblastoma multiforme which was in concordance with Thambi R et al., and Jaiswal J et al., [1,13].

The second most common group was meningiomas which were in concordance with Mondal S et al., [4], Thambi R et al., and Zalata KR et al., [1,10]. We had a higher number of cases of metastasis which was not agreeing with Mondal S et al., [4] but were in concordance with Thambi R et al., and Zalata KR et al., [1,10]. Only one case of oligodendroglioma was found which was in concordance with Thambi R et al., and not in concordance with Mondal S et al., which showed 8% of their tumours being oligodendrogliomas [1,4].

The neuroglial tumours constitute the major group of all the CNS tumours in present study. They form 32.2% of all the CNS tumours. They constitute a varied group with diffuse astrocytomas, oligoastrocytomas, ependymomas, etc. Among the various lesions, Glioblastoma multiforme form the largest group making about 9.6% (17 cases). They carry a poor prognosis with median 5-year survival rate less than three years. Incidence was more common in males and in the age group of 41-50 years. This was in concordance with Mondal S et al., Swaroop N et al., and Hema NA et al., and most series from Asian countries [4,5,14]. The site of involvement was more common in frontal lobe which was in agreement with Yadav N et al., and Hema NA et al [9,14]. The occipital lobe was not involved in present study. They were rarely seen in the infratentorial region. This was in concordance with Yadav N et al., Thambi R et al., Joshi H et al., and Gupta R et al., [9,15,16].

The relative frequency of meningiomas in present study was 30.5% of all the CNS tumours. This view was supported by studies like Mondal S et al., and Yadav N et al., [4,9]. Among the meningiomas meningothelial type were common which was similar to Mondal S et al., Hema NA et al., Mubeen B et al., [4,14,17]. A female preponderance was seen with a M:F ratio 1:1.4 was seen in many other studies like Mubeen B et al., and Patil PR et al., indicating the role of hormones (receptors) on the growth of the tumour [17,18]. Meningiomas were rare in the extremes of age group with a peak incidence in 40 years. This was in concordance with Thambi R et al., Mondal S et al., and Lee CH et al., [1,4,11]. The site of involvement was mostly the parietal lobe similar to studies like Swaroop N et al., and Zalata KR et al., [5,10].

Schwannomas were the third most common group in the series. They were usually seen only in the spinal region, vestibular region and CP angle similar to Thambi R et al., and Yadav N et al., [1,9]. In present study, schwannomas were common in females and in the age group of 51-60 years. This was in concordance with Yadav N et al., and Gupta D et al., [9,19], and not with Thambi R et al., or Hema NA et al., which showed male preponderance [1,14].

Metastasis was the next common group with 8.4% cases. This was in agreement with Thambi R et al., but not with Yadav N et al., and Hema NA et al., [1,9,14]. Metastasis was more common in males than in females. The predominant age of presentation is 51-60 years. This was in accordance with Singh S et al., and Kadaru MR [20,21]. The present study lays emphasis on the variety of brain tumours encountered in our institute and it provides us an idea on the approach to a differential diagnosis to be considered while reporting on the basis of histopathology and immunohistochemistry.

Limitation(s)

This study involved only population from a government institution which caters mostly to patients from low socio-economic status. So, this study is limited by hospital bias and does not involve larger

varied population. In this study, molecular findings could not be applied for the tumours as the facility was not available.

CONCLUSION(S)

Varied morphological types are seen within the CNS tumours. Histopathological diagnosis is very much necessary for the management. Clinical and radiological data plays an important role in the final diagnosis. In the present study gliomas, meningiomas and schwannomas were the most common tumours in their descending order. Males are mostly affected; 41-60 years age group was commonly involved. Thus, this study provides an insight into the incidence and emphasises the vast variety of CNS tumours. The new WHO classification lays more emphasis on molecular diagnosis of tumours and the future basis for diagnosis of CNS tumours relies mostly on molecular genetics.

In spite of the progress, histomorphology still remains the first step at arriving to a conclusive diagnosis. This study involves only histopathological diagnosis in congruence with immunohistochemistry. Thus, this is a preliminary step for further molecular testing.

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