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Histomorphological Spectrum of CNS Lesion at Tertiary Care Centre

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Abstract: ***Introduction: The annual incidence of central nervous system (CNS) tumors varies from 10 to 17 per 100, 000 people for intracranial tumors and 1 - 2 per 100, 000 people for intraspinal tumors. These tumors can be primary or metastatic, with the majority being primary. CNS tumors are a diverse group of neoplasms that can be classified into different categories based on their histological characteristics. Various factors such as age, race, ethnicity, gender, environmental factors, hormones, and genetics can play a role in the development of CNS tumors. Aims and Objectives: To study the histomorphological types of CNS lesions. To study the incidence of age, gender, and anatomical location, of CNS lesions. To study the frequency of CNS lesions according to the WHO (2021) grading system. Materials and Methods: A retrospective analysis of the histopathology records and clinical case files of total 109 cases were done. History was studied in detail in each case with respect to presenting complaints, site, age, and sex distribution. Specimens were fixed in 10% neutral buffered formalin followed by routine paraffin processing. Staining was done by using hematoxylin and eosin (H&E) stain. Mounting was done with DPX (distyrene, plasticizer, and xylene). Stained slides were examined under a light microscope. Reporting and diagnosis of CNS lesions were done as per WHO 2021 criteria. Results: In present study, a total of 109 cases of CNS lesions were studied histologically in which 63 patients were female (57.79%) and 46 patients were male (42.20%) Overall Male to Female ratio was 0.73/1. The neoplastic lesion was 75.3% and non neoplastic lesion was 24.7%, Neoplastic lesion was more frequent than non neoplastic in the present study.***

Keywords: CNS lesion, Histopathology, WHO classification

1. Introduction

The annual incidence of CNS tumors ranges from 10 to 17 per 1 lakh persons for intracranial tumors and 1 - 2 per 1 lakh persons for intraspinal tumors. Majority of these tumors are primary while, one - fourth to half of the lesions are metastatic. (1, 2).

Tumors of the central nervous system (CNS) are a heterogeneous group of neoplasms which includes benign and malignant tumors of the brain and spinal cord**. (3)** Various factors such as age, race, ethnicity, gender, environmental factors – most common being exposure to high dose of ionizing radiation (**4),** hormones, and genetics can play important role in the etiology of CNS tumors. CNS tumors that predominates in adults differ from those seen in children, in terms of frequency, their histological type and location. **(6)** Clinical features of CNS tumor are headache, vomiting and/ or seizures, behavioural problems, focal deficits and visual difficulties, which depends on the location, size of the tumor, biology and pattern and rate of the tumor growth. (4, 6 Henry, himansu, devika) CNS lesions cause life threatening outcome irrespective of the nature of tumor because lesions grow in a confined space and these are close to vital organs. Radiological assessment helps in diagnosis of CNS lesions, their location and nature - whether benign or malignant. (kinkhede) But radiological imaging cannot give exact diagnosis of lesions. For definitive diagnosis and grading of CNS tumors, histopathology remains the gold standard.

Tumors of the nervous system are histologically typed by WHO classification as tumors of neuroepithelial tissue, peripheral nerves, meninges, mesenchymal non - meningothelial tumors, lymphomas, germ cell tumors and metastatic tumors.

CNS tumor classification (fifth edition of WHO classification) has been based on histological findings supported by ancillary tissue - based tests (eg. Immunohistochemistry (IHC), ultrastrucural). (Louis et al). Various markers useful in CNS lesions are: Markers for Glial tumors - GFAP, S100
Meningeal tumors - EMA, Vimentin, SSTR2a
Neuronal tumors - Synaptophysin, NSE, MAP - 2
Schwann cell tumors - S100, Leu 7.

2. Materials and Methods

A retrospective analysis of the histopathology records and clinical case files of total 109 cases were done. History was studied in detail in each case with respect to presenting complaints, site, age, and sex distribution. Specimens were fixed in 10% neutral buffered formalin followed by routine paraffin processing. Staining was done by using hematoxylin and eosin (H&E) stain. Mounting was done with DPX (distyrene, plasticizer, and xylene). Stained slides were examined under a light microscope. Reporting and diagnosis of CNS lesions were done as per WHO 2021 criteria.

3. Results

In present study, a total of 109 cases of CNS lesions were studied histologically in which 63 patients were female (57.79%) and 46 patients were male (42.20%). Overall Male to Female ratio was **0.73/1.** The neoplastic lesion was **75.3%**

and non neoplastic lesion was **24.7%,** Neoplastic lesion was more frequent than non neoplastic in the present study.

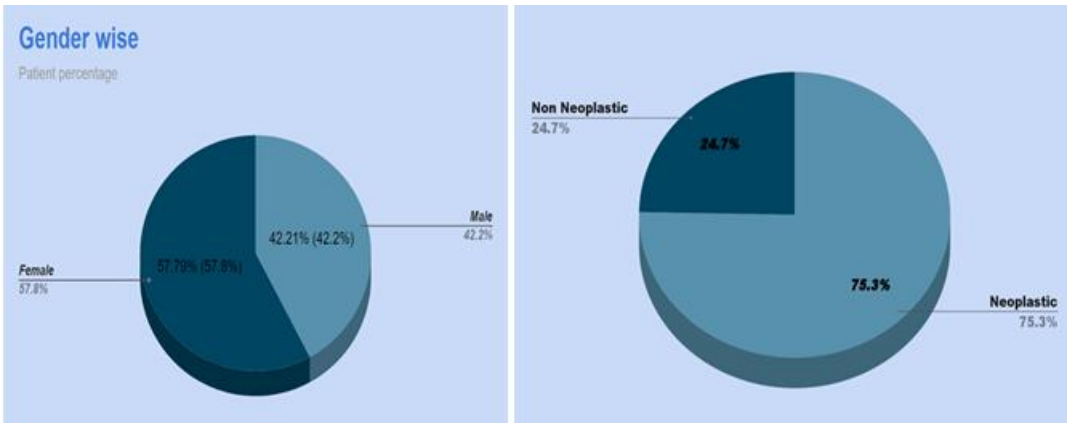

Table 1: Age and Sex wise distribution

Diagnosis	0- 10 Years (M/F)	11- 10 Years (M/F)	21 – 30 Years (M/F)	31 – 40 Years (M/F)	41 - 50 Years (M/F)	51 – 60 Years (M/F)	> 60 Year (M/F)	Total
Neoplastic	2/6	2/3	6/8	5/4	13/14	3/3	03/10	34/48
Total neoplastic lesion	08	06	14	09	**27 (32.9%)**	06	13	82
Non - neoplastic lesions	3/9	1/2	2/1	3/1	2/1	0/0	01/1	12/15
Total non - neoplastic lesions	**12 (44.4%)**	03	03	04	03	00	02	27
Total	5/15	3/5	8/9	8/5	15/15	3/3	4/11	46/63
Total	20 (18.3%)	8	17 (15.5%)	13	**30 (27.5%)**	6	15	**109**

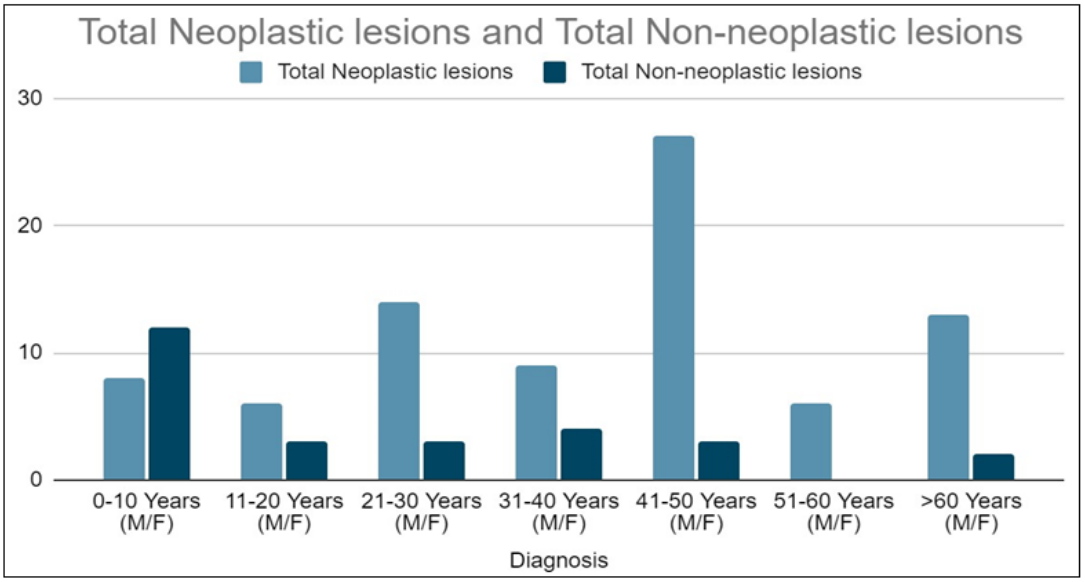

Table 2

	No of case	% of case
Neoplastic lesions		
Tumor of meninges	27	32.90%
Tumor of Neuroepithelial tissue (Astro, Glio, Oligo, DNET, Ependymal)	34	**41.40%**
Embryonal Tumor	4	4.80%
Tumor of cranial and paraspinal neuron (Schwannoma, Neurofibroma)	13	15.80%
Metastatic Adenocarcinoma	1	1.20%
Tumor of sellar (Pitutary, craniophary)	3	3.60%
Total Neoplastic lesions	**82**	100%
Non - Neoplastic lesions		
Reactive / cystic lesion	12	**44.40%**
Infective	7	25.90%
Congenital lesions	8	29.60%
Total Non - Neoplastic lesions	**27**	100%

4. Discussion

The present study assessed histomorphological spectrum of intracranial space occupying lesions at a tertiary care hospital. In the present study, there were 109 cases of intracranial space occupying lesions that showed several common features with other published series. The most common age group affected by CNS lesions was fourth decade in our study which was consistent with most of the reported series. There were 37 cases of pediatric brain lesion that occurred below 20 years of age, which is 33.9 % of total case in present study that was comparable to Hema et al (32.2%) and higher than other observation of Rathod et al (18%), Butt et al (16%), Kothari et al (11%). (6, 7, 8, 9)

The present study examined 109 CNS lesions, with a gender distribution of 57.79% female (63 cases) and 42.20% male (46 cases). This yields a male - to - female ratio of 0.73: 1, indicating a slightly higher proportion of female patients in the study.

Table 3: Comparison of Histological type of CNS tumors

Sr. No.	Lesions	Present study (2023)	Aryal G et al	Monga et al	Hema et al	Himanshu et al	Ratnaprabha et al
1.	Tumors of Neuroepithelial tissue	41.4%	38.6%	51.42%	56.3%	53.2%	52%
2.	Tumor of Meninges	32.9%	14%	17.14%	12.5%	19.4%	18%
3.	Tumors of cranial and paraspinal nerves	15.8%	5.2%	4.28%	16.6%	22.6%	8%
4.	Metastatic tumors	1.2%	14%	1.42%	0%	1.6%	5%
5.	Tumors of sellar region	3.6%	5.2%	10%	2.1%	3.2%	3%
6.	Embryonal tumors	4.8%	3.5%				8%

Central nervous system (CNS) tumors are a diverse group of neoplasms that can be classified into different categories based on their histological characteristics. The frequency of these tumor types can vary across different studies. For instance, tumors of neuroepithelial tissue are the most common type, accounting for 41.4% of cases in the present study (2023), 38.6% in Aryal G et al, 51.42% in Monga et al, 56.3% in Hema et al, 53.2% in Himanshu et al, and 52% in Ratnaprabha et al. (3, 4, 6, 10)

Tumors of meninges are another type, making up 32.9% of cases in the present study (2023), 14% in Aryal G et al, 17.14% in Monga et al, 12.5% in Hema et al, 19.4% in Himanshu et al, and 18% in Ratnaprabha et al. Tumors of cranial and paraspinal nerves account for 15.8% of cases in the present study (2023), 5.2% in Aryal G et al, 4.28% in Monga et al, 16.6% in Hema et al, 22.6% in Himanshu et al, and 8% in Ratnaprabha et al. Metastatic tumors are less common, making up 1.2% of cases in the present study (2023), 14% in Aryal G et al, 1.42% in Monga et al, 0% in Hema et al, 1.6% in Himanshu et al, and 5% in Ratnaprabha et al. (3, 4, 6, 10)

Additionally, tumors of the sellar region account for 3.6% of cases in the present study (2023), 5.2% in Aryal G et al, 10% in Monga et al, 2.1% in Hema et al, 3.2% in Himanshu et al, and 3% in Ratnaprabha et al. Finally, embryonal tumors make up 4.8% of cases in the present study (2023), 3.5% in Aryal G et al, and 8% in Monga et al. It is important to note that the frequencies of these tumor types can vary across different studies and populations.

There were few cases which were further confirmed by immunohistochemistry in our centre.

One of the case in a 4 year female patient was diagnosed as ‘Undifferentiated malignant tumor’ in the H&E and biopsy was taken from cerebrum (frontotemporal region). Further immunohistochemistry was done which showed positivity for Desmin (Focal, moderate) and SMA and GFAP was negative. Findings favoured possibility of ‘Ectomesenchymoma’. It is an uncommon malignant tumor, mainly occur in young age group with predilection for central nervous syst. (11)

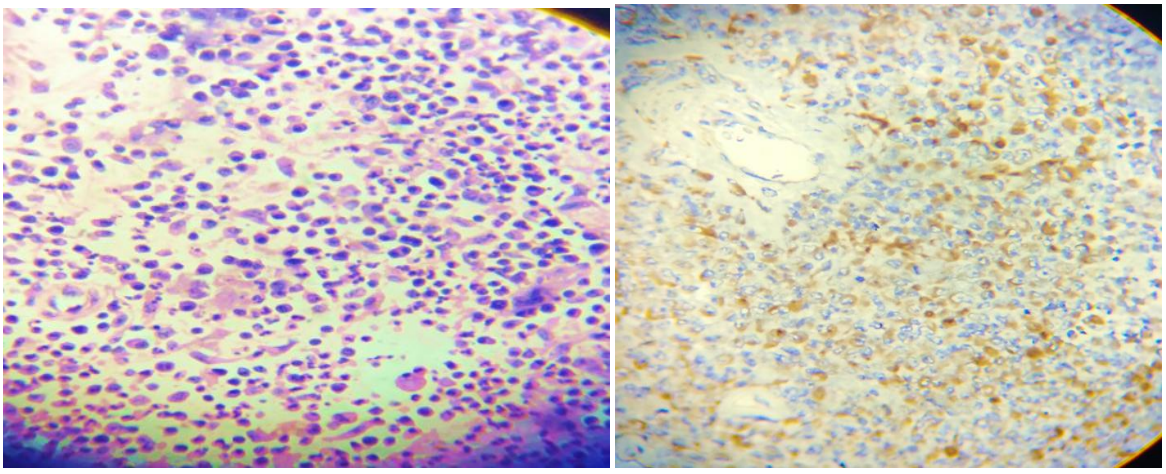

Figure 1: Right side IHC image shows DESMIN postitivity

Another case in a 5-year male patient with headache since a month was reported as High-grade malignant tumor in histopathology. Further IHC was done. It showed positivity for SMA, Pancytokeratin, EMA, Chromogranin an while GFAP was negative. The findings were suggestive of high-grade CNS tumor Grade - 4, most probably Atypical teratoid/rhabdoid tumor (AT/RT). (11)

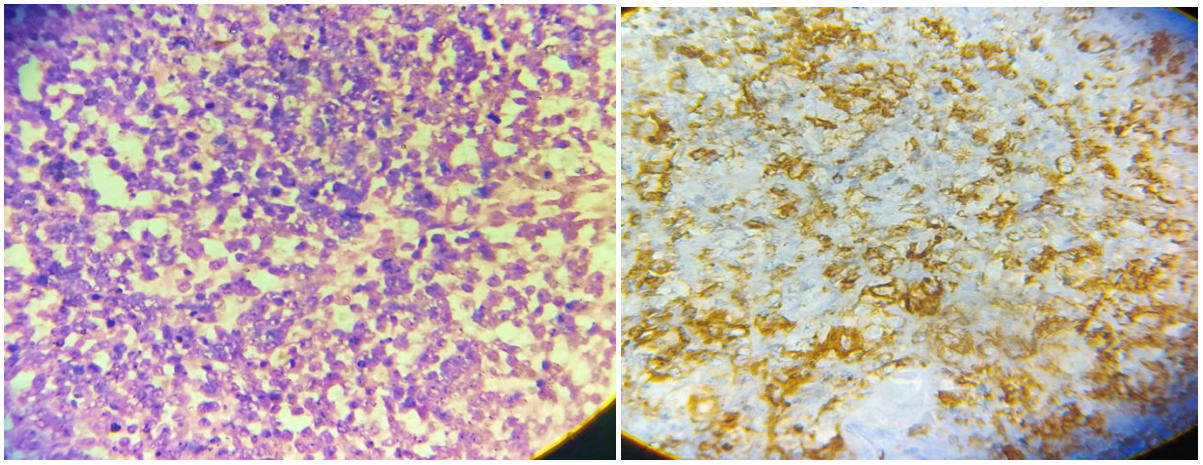

Figure 2: Right side IHC image shows EMA postitivity.

5. Conclusion

The histopathologist plays a vital role in accurate diagnosis of various CNS lesions which help for the patient prognosis and treatment. Our study gives spectrum of neoplastic and non neoplatic intracranial space occupying lesions and its relative frequency in a tertiary care hospital. We concluded that neoplastic lesions were frequent than non neoplastic entities and overall female preponderance were documented. Clinical, radiological and histomorphological findings, all must be taken in account for the final diagnosis.

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