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Original Research Article

HISTOPATHOLOGICAL STUDY OF NEOPLASTIC LESIONS OF BRAIN IN NORTH WEST RAJASTHAN

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Abstract

Background: Cancers of the central nervous system (CNS) are considered to be the most notorious among all cancers. Brain tumors are a mixed group of neoplasms that originate from the intracranial tissues and the meninges with degrees of malignancy varying greatly from benign to aggressive. The WHO classification offers a crude histological grading system, in which each CNS tumor is classified as Grades I-IV according to its degree of malignancy. Primary neoplasms of CNS represent nearly two-thirds of all brain tumours.

Methods: The study was carried out in the Department of Pathology, Sardar Patel Medical College and associated group of hospitals, Bikaner. It was a hospital based retrospective and prospective study for 5 years from 2015 to 2020, including brain biopsies / tissue following surgical resection, submitted at our department. Improper and autolysed specimens and cases without proper clinical history were excluded.

Results: We included a total of 245 cases of CNS malignancies received at our department during the study period in our study. Of total 245 cases, as in Table no. 1, most common tumor noted was Astrocytoma with 37.55% cases, followed by Meningioma 18.78% cases, Pituitary adenoma 8.57% cases and Pilocytic Astrocytoma 7.76% cases, whereas only one case (0.41%) was recorded each for Subependymoma, Neurocytoma, Haemangioma, Haemangiopericytoma and Spindle cell tumor. The most common tumors were diffuse astrocytic and oligodendroglial tumors with total 41.63% (n=102) cases followed by Meningial tumors with total 18.78% (n=46) cases.

Conclusions: The most frequent type of CNS tumours in this study was astrocytoma, followed by meningioma. This study may provide the representative prevalence of various types of CNS tumors. Thus, from the point of view of treatment of the different tumors of central nervous system mostly presenting with common clinical symptoms there is a direct need for a histopathological study in order to arrive at a correct diagnosis as for instance in the present study to know the type of tumor and their further typing and also its histological grade from the point of view of prognosis.

Keywords: Brain Tumors, Astrocytoma, Meningioma, CNS Tumors

Introduction:

Cancers of the central nervous system (CNS) are considered to be the most notorious among all cancers. Brain tumors are a mixed group of neoplasms that originate from the intracranial tissues and the meninges with degrees of malignancy varying greatly from benign to aggressive. Tumors of central nervous system have unique characteristics. The frequency and location of CNS tumors in children differ from that in adults. In adults majority of tumors arise above tentorium while in children 70% of intracranial tumors arise in the posterior fossa. Histological type of tumors is also different in children and adults.[1] CNS tumors are divided into seven categories: These are:- Tumors of neuroepithelial tissue; tumors of the cranial and paraspinal nerves; tumors of the meninges; lymphomas and hematopoietic neoplasms; germ cell tumors; tumors of the sellar region and metastatic tumors. The WHO classification offers a crude histological grading system, in which each CNS tumor is classified as Grades I-IV according to its degree of malignancy. Primary neoplasms of CNS represent nearly two-thirds of all brain tumours. The term primary brain tumour encompasses neoplasm and related mass lesion that arise from the brain and its linings. The brain and meninges are also common sites of secondary tumour implantation and when this happens, the tumours are called metastatic brain tumours. 60% to 80% of brains tumours are primary and rest 20% to 40% are metastatic.[2]

Materials and methods

The study was carried out in the Department of Pathology, Sardar Patel Medical College and associated group of hospitals, Bikaner. It was a hospital based retrospective and prospective study for 5 years from 2015 to 2020, including brain biopsies / tissue following surgical resection, submitted at our department. Improper and autolysed specimens and cases without proper clinical history were excluded. Clinical history and relevant investigations were noted from clinical records. Gross examination was carried out on specimens. Specimens immediately transferred to 10% formalin for 24 hours then grossed. The gross findings were noted. Tissue bits routinely processed 3 to 6 micron thick sections made from paraffin embedded blocks and

were stained with H&E stain. Special stains will be done whenever necessary.

Results

We included a total of 245 cases of CNS malignancies received at our department during the study period in our study. Of total 245 cases, as in Table no. 1, most common tumor noted was Astrocytoma with 37.55% cases, followed by Meningioma 18.78% cases, Pituitary adenoma 8.57% cases and Pilocytic Astrocytoma 7.76% cases, whereas only one case (0.41%) was recorded each for Subependymoma, Neurocytoma, Haemangioma, Haemangiopericytoma and Spindle cell tumor. The most common tumors were diffuse astrocytic and oligodendroglial tumors with total 41.63% (n=102) cases followed by Meningial tumors with total 18.78% (n=46) cases. The ratio of diffuse astrocytic and oligodendroglial to meningeal tumors is 2.22:1. The least common tumors were Neuronal and mixed neuronal glial tumors with only 0.41% (n=1) case.

Table 1: number of cases of different CNS lesion studied divided as per revised who criteria

Major classes	Diagnosis	No. of Cases	%	Total	%
Diffuse astrocytic and oligodendroglial tumors	Astrocytoma	92	37.55	102	41.63
	Oligodendroglioma	8	3.27		
	Oligoastrocytoma	2	0.82		
Other astrocytic tumors	Pilocytic Astrocytoma	19	7.76	19	7.76
Ependymal tumors:	Ependymoma	12	4.90	13	5.31
	Subependymoma	1	0.41		
Choroid plexus tumors	Choroid plexus Papilloma	2	0.82	2	0.82
Neuronal and mixed neuronal glial tumors	Neurocytoma	1	0.41	1	0.41
Embryonal tumors	Medulloblastoma	13	5.31	13	5.31
Tumors of the cranial and paraspinal nerves	Schwannoma /Neurilemmoma	7	2.86	7	2.86
Meningeal	Meningioma	46	18.78	46	18.78
Mesenchymal, non meningothelial tumors	Haemangioma	1	0.41	8	3.27
	Haemangioblastoma	6	2.45		
	Haemangiopericytoma	1	0.41		
Tumors of the sellar region	Craniopharyngioma	4	1.63	5	2.04
	Spindle cell tumor	1	0.41		
Metastatic	Metastatic carcinoma	8	3.27	8	3.27
Pituitary Tumors	Pituitary Adenoma	21	8.57	21	8.57
Total		**245**	**100**	**245**	**100**

We noted that maximum numbers of patients were in the 4th decade of life with 20.00% cases, followed by 2nd decade with 17.55% cases. Minimum numbers of cases were found in 7th decade with total of 1.22% (n=3) cases as shown in chart 1. The tumors are more common in males with 59.59% (n=146) cases than in females with 40.41% (n=99) cases. Overall male to female ratio was 1.47:1.

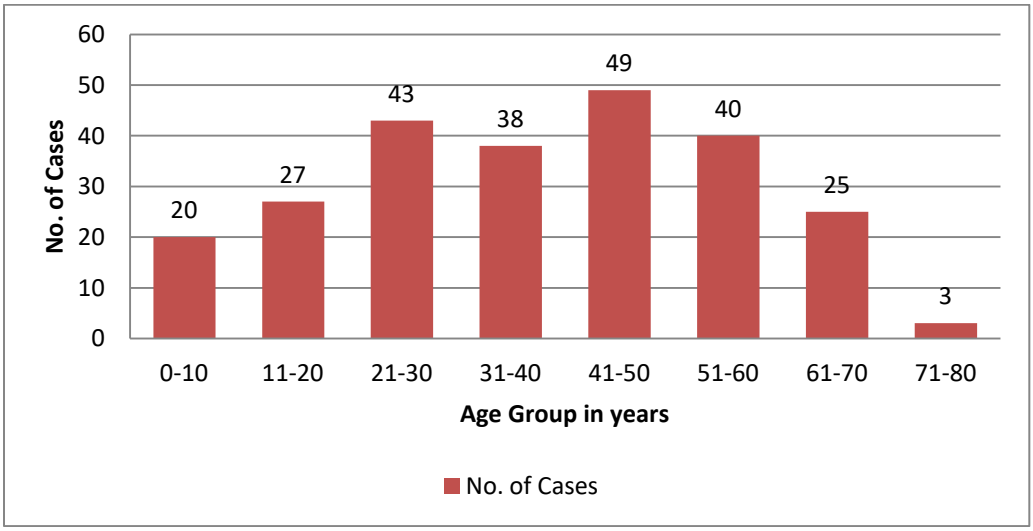


Chart 1: Age wise distribution of different CNS lesions

We found that maximum number of cases were in frontal lobe with 20.82% (n=51) cases followed by fronto-temporal 12.24% (n=30), suprasellar region 10.61% (n=26) cases and temoral region 10.20% (n=25) cases as shown in table no 2. The tumors were most common on left side 35.51%, (n=87) cases than midline tumors with 32.24% (n=79) cases and right side 31.84% (n=78) cases. Only one tumor (0.41%) was reported on the base of skull [Chart 3].

Table 2: Site wise distribution of different CNS tumors

Site	No. of Cases	Percentage (%)
Frontal	51	20.82
Fronto-parietal	17	6.94
Fronto-temporal	30	12.24
Temporal	25	10.20
Parietal	14	5.71
Occipital	3	1.22
Temporo-parietal	14	5.71
Parieto-occipital	8	3.27
Corpus callosom	3	1.22
Cerebellum	9	3.67
CP angle	7	2.86
Mid Brain	1	0.41
Posterior Fossa	21	8.57
Suprasellar	26	10.61
Olfactory groove	1	0.41
Middle fossa	3	1.22
Thallamus	1	0.41
Falx cerebri	1	0.41
Intraventricular	4	1.63
Cavernous Sinus	1	0.41
Intradural	1	0.41
Tentorial	1	0.41
IV ventricle	2	0.82
Sphenoid cavity	1	0.41
Total	**245**	**100.00**

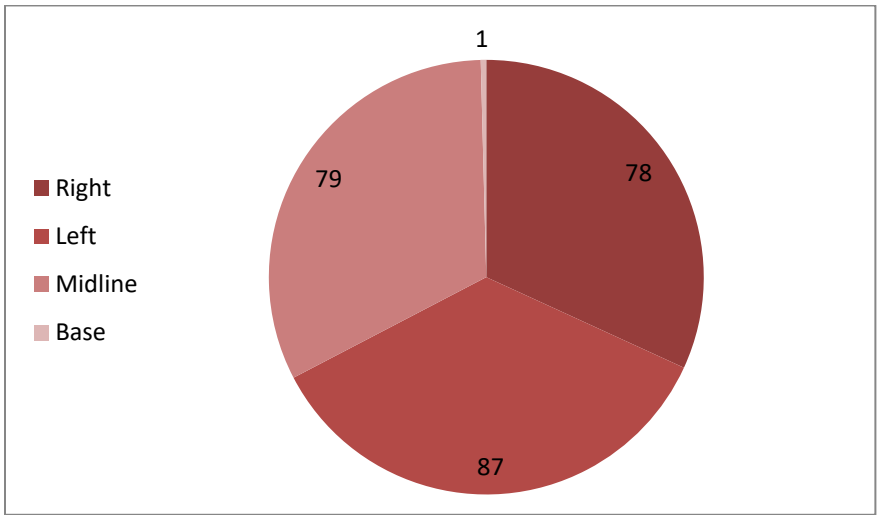


Chart 3: Distribution of cases according side of cns involved

As shown in Table no. 3, a total of 212 cases were graded according to WHO classification. We observed that majority of the tumors belonged to Grade I with 34.91% (n=74) cases and Grade II with 30.19% (n=64) cases followed by grade IV 27.36% (n=58) and Grade III with 7.55% (n=16) cases.

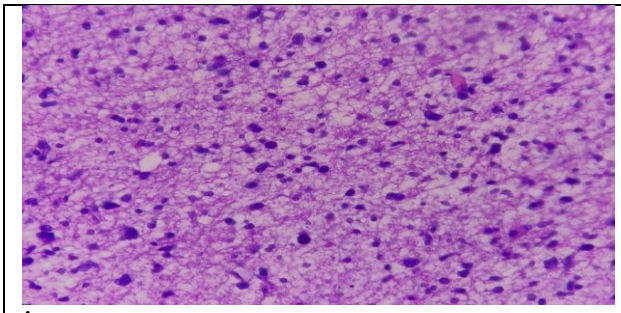
Table 3: distribution of neoplastic cases according to grading

Tumours	Grade 1	Grade 2	Grade 3	Grade 4
Astrocytoma		33	11	45
Oligodendroglioma		7	1	
Oligoastrocytoma		2		
Pilocytic Astrocytoma	19			
Ependymoma		12		
Subependymoma	1			
Choroid plexus Papilloma	2			
Neurocytoma		1		
Medulloblastoma				13
Schwannoma / Neurilemmoma	7			
Meningioma	35	7	4	
Haemangioblastoma	6			
Haemangiopericytoma		1		
Craniopharyngioma	4			
Spindle cell tumor		1		
Total	**74 (34.91%)**	**64 (30.19%)**	**16 (7.55%)**	**58 (27.36%)**
Grand Total				**212**

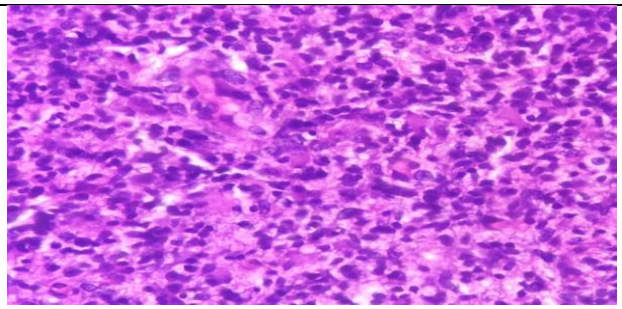
In cases of diffuse astrocytomas Seven cases showed many (>20%) gemistocytic neoplastic astrocytes and were diagnosed as **gemistocytic astrocytoma.** Among cases of Grade 4 glioblastomas One case showed bizarre, multinucleated giant cells, smaller fusiform cells associated with severe nuclear atypia, cellular pleomorphism, mitotic activity, microvascular proliferation and necrosis diagnosed as giant cell glioblastoma.

In cases of meningeal tumors the most common meningioma were Grade I meningioma with 76% (n=35) cases. The most common histological subtypes of meningioma was meningothelial with 30.43% (n=14) cases, followed by fibroblastic with 19.57% (n=9) cases.

A total of eight cases of metastatic tumors were found.



A



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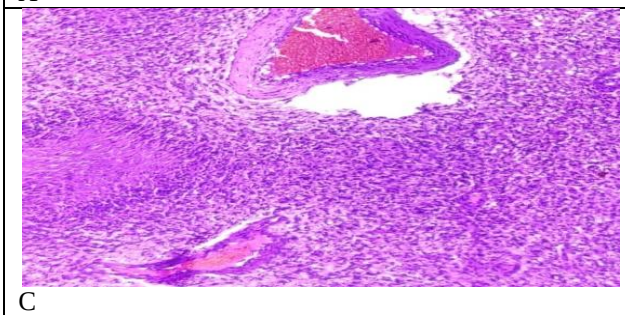

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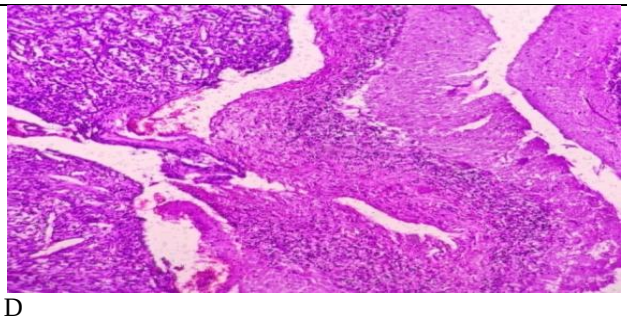


D

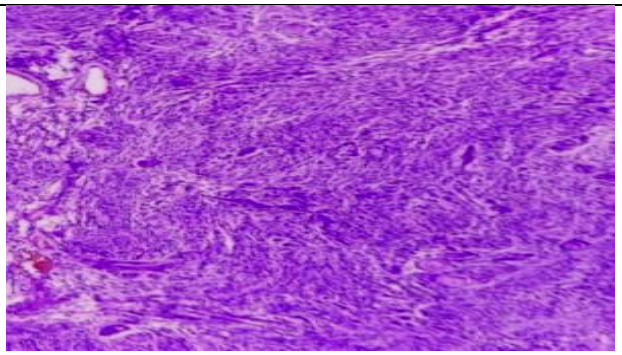
A. Diffuse astrocytoma (Grade II Astrocytoma): Showing moderately cellular tumor composed of uniform astrocytic cells with microcystic stroma. (H&E, 40X)

B. Anaplastic Astrocytoma (Grade III Astrocytoma): Hypercellularity and hyperchromic, irregular "naked nuclei" appearing within a fibrillary background. Several mitotic figures are also seen. (H&E, 40X)

C. Glioblastoma Multiforme (Grade IV Astrocytoma): Cellular glioma composed of poorly differentiated, pleomorphic astrocytic tumor cells with marked nuclear atypia and brisk mitotic activity, microvascular proliferation and palisaded necrosis. (H&E 10X).

D. Pilocytic Astrocytoma: Showing piloid cells with Rosenthal fibres, hyaline globules. Hyalinesd vessels and loose textured multipolar cells. (H&E 10X)

Image 1 (A, B, C, D) : Showing Astrocytic tumors.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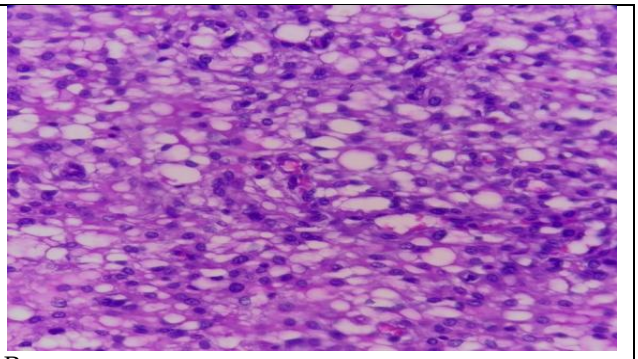
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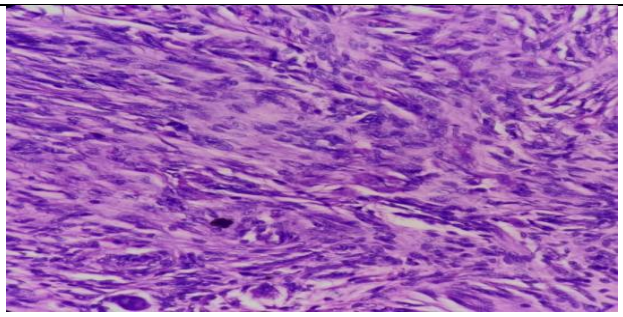
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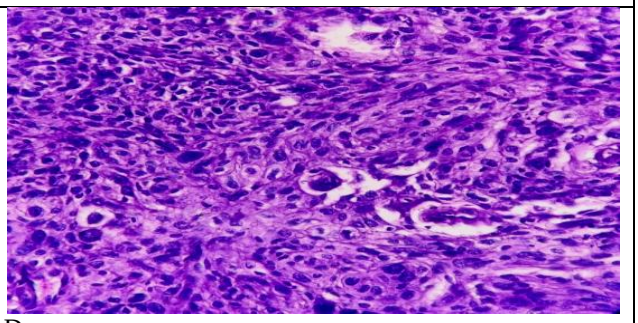
D

A. Meningothelial Meningioma: Showing tumor cells forming lobules separated by thin fibrous septae with typical intranuclear inclusions and whorl formation. (H&E, 10X)	**B.** Microcystic Meningioma: Showing extensive microcysts formation, cells having elongated processes and loose myxoid background. (H&E, 40X)
C. Fibroblastic Meningioma: Showing sheet like architecture composed of spindle cells with indistinct bounderies. (H&E,40X)	**D.** Anaplastic Meningioma: Showing hypercellular tumor with marked pleomorphism and numerous typical and atypical mitoses. (H&E,40X)

Image 2 (A, B, C, D) : Showing different meningeal tumors

Discussion

It has been noted that substantial differences exist between countries, geographic areas and ethnic groups for incidence of malignancies of the nervous system.[3] Moreover, even within a particular country specific regions may have differing prevalence of CNS tumors of different histological types. During the period of this study from 2015-2020, 245 patients were diagnosed with histologically confirmed central nervous system tumors. We studied the spectrum of different tumors and grouped these as per revised WHO classification. As shown in Table no. 4 most common type of CNS tumor was astrocytoma followed by meningioma. In our present study we found that most common tumors of central nervous system is still the diffuse astrocytic and oligodendroglial tumors with 41.63% cases and second most common tumors were meningeal tumors with 18.78% cases. Our findings are consistent with studies conduted in China, Pakistan and other parts of India.[4,5,6,7]

Table 4: histological distribution of CNS tumors in various studies

Country	Author	Diffuse Astrocytoma and oligodendroglial tumors	Pilocytic Astrocytoma	Meningiomas	Tumors of Cranial and paraspinal nerves	Tumors of Sellar region	Hematopaoitic tumors	Metaststic Tumors
China	Chen et al [5]	37.55	1.68	36.5	13.3	4.1	1.7	5.1
Pakistan	Ahsan et al [6]	51	4.9	28.3	5.4	2.6	2.4	4.9
India	Khonglah Y et. al. [7]	27.80	-	20.97	18.04	4.8	1.95	2.43
India	Jat KC et al [4]	55.93	3.39	22.03	3.38	-	1.69	1.69
India	Present Study	41.63	7.76	18.78	2.86	2.04	3.27	3.27

The age distribution of all CNS tumours showed a gradual increase in tumour cases with increasing age, peaking in the age group 41-50 years and tapering off thereafter. Fan et al,[8] also reported proportionally low frequencies of CNS tumours at both ends of the age spectrum (below 10 years old and greater than 70 years). The rise in incidence of brain tumours is consistent with virtually all other adult tumours. In our study we found higher male affliction of CNS tumors. Rachet et al[9] proposed that brain tumours are 20-50% more common in men in western nations. The life-time risk of being diagnosed with a CNS malignancy is estimated to be 0.67% for men and 0.52% for women.[10] In separate studies performed on two continents, McKinney et al, and Fan et al found comparable results suggesting a male-to-female ratio of 1.5 : 1.[8,9] Regional studies in the USA , by contrast, showed only a marginal male predominance in CNS tumour occurrence or even female predominance.[11]

In this study we found maximum cases of Grade IV astrocytoms. Jat KC (2016)[4] and Ahsan et al (2015)[6] also reported maximum number of cases of Grade IV astrocytomas which is consistent with our study whereas Nibhoria et al (2015)[12] who conducted the study at Punjab, India found out maximum number of cases in Grade III astrocytomas which is in contrast of our present study. Surveys of both regional and national registries in the USA showed similarly high proportions of glioblastoma.[13]

Meningiomas were second most commonly occurring histologically specific CNS Neoplasm in our study. These tumours accounted for 18.78% (n=46) of all CNS neoplasm diagnosed and histo-pathologically confirmed at our facility out of 245 neoplastic tumour. When comparing these results to those from studies conducted in USA, we notice a lower prevalence of meningioma in our study. The proportion of these tumours as a percentage of all intracranial tumours in the USA was reportedly 22.6%-33.8%.[14] In our opinion this may be due to the availability of imaging modality in developed countries which is required for diagnosis of meningioma.

Conclusion

The most frequent type of CNS tumours in this study was astrocytoma, followed by meningioma. This study may provide the representative prevalence of various types of CNS tumors. Thus, from the point of view of treatment of the different tumors of central nervous system mostly presenting with common clinical symptoms there is a direct need for a histopathological study in order to arrive at a correct diagnosis as for instance in the present study to know the type of tumor and their further typing and also its histological grade from the point of view of prognosis.

Bibliography

1. Frosch M.P., Anthony D.C., Girolami D. U. : The Central Nervous System In : Robbins and Cotran, editor, Text book of Pathologic basis of disease. 9th edition, New York : Elsevier; 2010:1251-1319.
2. Rubin P, Mc Donald S, Qazi R. Clinical oncology, 7th edition , Philadelphia: WE saunders; 1993.
3. Leece R, Xu J, Ostrom QT, Chen Y, Kruchko C, Barnholtz-Sloan JS. Global incidence of malignant brain and other central nervous system tumors by histology, 2003-2007. Neuro Oncol. 2017;19(11):1553-1564.
4. Jat KC, Vyas SP, Bihari NA, Mehra K. Central nervous system tumors: a histopathological study. Int J Res Med Sci 2016;4: 1539-45.
5. Chen L, Zou X, Wang Y, Mao Y, Zhou L. Central nervous system tumours: A single centre pathology review of 34,140 cases over 60 years. BMC Clin Pathol 2013;13:14.
6. Ahsan J, Hashmi SN, Muhammad I, Din HU, Butt AM, Nazir S, *et al*. Spectrum of central nervous system tumours A single center histopathological review of 761 cases over 5 years. J Ayub Med Coll Abbottabad 2015;27:81-4
7. Khonglah Y, Shangpliang D, Mishra J, Mustafa A, Kakoti A, Phukan P. Histological spectrum of central nervous system lesions at a tertiary care center in India. Clin Cancer Investig J 2020;9:175-81
8. Fan K. & Pezeshkpour G.H. (1992) Ethnic Distribution of Primary Central Nervous System Tumours in Washington , DC, 1971 TO 1985 J NatI Med Assoc. 84 (10) : 858-863.
9. Rachet B., Mitry E. , Quinn M.J. , Cooper N & Coleman N.P. (2008) Survival from brain tumours in England and Wales up to 2001 British Journal of Cancer 99 : S98 – S101.
10. Gurney J. & Kadan-Lottick N. (2001) Brain and other central nervous system tumors: rates, trends, and epidemiology Current Opinion in Oncology 13 : 160–166.
11. Fang Z. , Kulldorff M. & Gregorio D.I. (2004) Brain cancer mortality in the United States,1986 to 1995: A geographic analysis Neuro-Oncology 6 : 179–187
12. Nibhoria S, Tiwana KK, Phutela R, Bajaj A, Chhabra S, Bansal S. Histopathological Spectrum of Central Nervous System Tumors: A Single Centre Study of 100 Cases. Int J Sci Stud 2015;3(6):130-134.
13. Hoffman S., Propp J.M. & McCarthy B.J. (2006) Temporal trends in incidence of primary brain tumors in the United States, 1985–1999 Neuro-Oncology 8 : 27–37
14. Delattre JY, Krol G. Thaler HT. et al, Distribution of brain metastases Arch Neurol., 1988 :45: 74-44.