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Spectrum of Central Nervous System Tumors - A Four Year Study In A Tertiary Care Center

Dr M Beulah Priscilla[1], Dr P R D Ganesh Basina[2*], Dr N.C Parankusa[3]
Dr R Vijaya Bhaskar[4]

[1] *Assistant Professor, Department of Pathology, Rangaraya Medical College, Kakinada, Andhra Pradesh, India*
[2*] *Assistant Professor,Department of Pathology, Rangaraya Medical College, Kakinada, Andhra Pradesh, India*
[3] *Assistant Professor, Department of Pathology, Rangaraya Medical College, Kakinada, Andhra Pradesh, India*
[4] *Professor and Head, Department of Pathology, Rangaraya Medical College, Kakinada, Andhra Pradesh, India*
**Corresponding Author: Dr P R D Ganesh Basina*

Abstract:
Introduction: *Tumours of central nervous system constitute 1%-2% of tumours in adults. Few studies are available from India which show a lower incidence of brain tumours compared to the developed countries. Not much is known about the epidemiology of brain tumours in South Indian population.*
Aim: *To identify the age and gender distribution, different histological types and grades of brain tumours according to 2016 WHO classification.*
Material and Methods: *A retrospective study of 122 cases of brain tumours over a period of four years was done. We reclassified and graded the tumors based on 2016 WHO classification. Age and gender distribution, clinical presentation, site of tumour and histopathologic patterns with grade were noted and the data was analysed.*
Results: *Predominant age group affected was between 40-50 years, with a male to female ratio of 1.14:1. Diffuse Astrocytic tumors were the most common type, followed by Meningiomas. Majority of cases were of WHO grade II and involved frontal lobe predominantly.*
Conclusion: *This study gave a glimpse of the representative incidence of various types of CNS tumors in our institution. Over all the age and gender distribution, histological pattern and grading of CNS tumours in our cohort paralleled with the national data.*

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I. Introduction

Central nervous system lesions are heterogenous with a wide spectrum of histological patterns such as inflammatory, infective, metabolic and neoplastic in origin with varied clinical presentations. Of which CNS neoplasms constitute a unique population of neoplasms and include both benign and malignant tumours. In India, the incidence of tumors of the CNS range from 5 to 10 per 100,000 population and account for about 2% of all malignancies.[1] Classification of brain tumors is based on microscopic similarities with putative cells of origin and their differentiation states. WHO 2016 classification incorporated well established molecular parameters into consideration. NOS diagnostic designation has been included in the classification particularly for the centers which are unable to carry out molecular analyses.[2]

Not much is known about the epidemiology of brain tumors in South Indian population. The present study is an attempt to identify the age groups, gender distribution, topography and different histological types of brain tumours in the population attending our hospital.

II. Material And Methods

We did a retrospective study in the Department of Pathology, Rangaraya Medical College, Kakinada over a period of four years from January 2014 to December 2017 on neurosurgical biopsies received from Department of Neurosurgery. Non neoplastic and inflammatory lesions of the brain were excluded.

A total of 122 biopsies of CNS tumours were received. Patient's clinical data including details of imaging were obtained. Gross features of all the specimens were assessed and processed by routine paraffin embedding techniques. Sections were stained with Haematoxylin & Eosin stain. Histopathological diagnosis was done according to 2016 WHO classification. Since the molecular testing and cytogenetic studies were not available in our institution, the diagnoses was reclassified as tumours NOS. Final results were analyzed and data was prepared to study histological patterns of CNS tumors with age and sex distribution in our area.

III. Statistical analysis

Age and gender distribution, site of tumour and histopathologic patterns with WHO grade were noted and the data was re-analyzed according to recent WHO classification.

IV. Results

A total of 122 cases of CNS tumours were analyzed over a period of four years. These included 120 cases of primary brain tumours and 2 cases of metastases to brain. The year wise distribution of cases showed a decrease in number of cases from 2014 to 2016 and an increase in 2017. [Fig-1]. In our study the predominant age group affected was between 40-50 years [Fig-2]. There were only 14 cases of pediatric brain tumours (age<18 years) in our study [Table 1].

Figure 1: Year wise distribution of CNS tumors

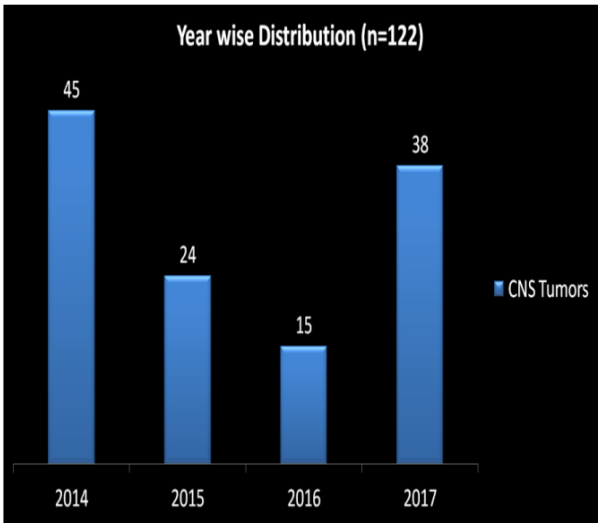


Figure 2: Age distribution of CNS tumors

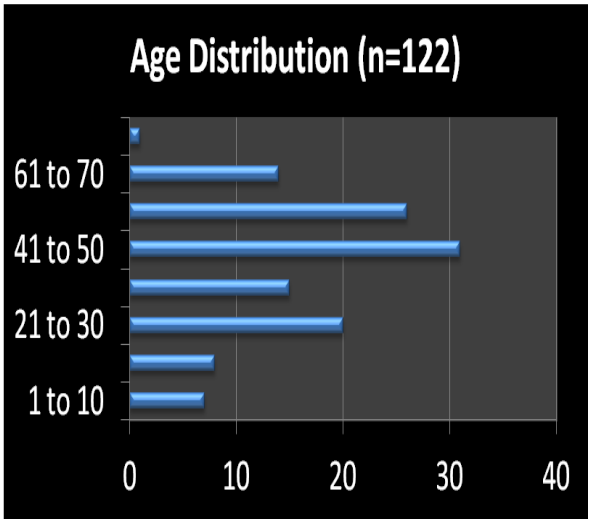


Table 1: Distribution of CNS tumors under pediatric age group

S.No	Age	Sex	Histopathological Diagnosis	WHO Grade
1	6	Female	Pilocytic Astrocytoma	I
2	7	Male	Diffuse Astrocytoma	II
3	9	Female	Diffuse Astrocytoma	II
4	10	Female	Subependymal giant cell Astrocytoma	I
5	10	Male	Pilomyxoid Astrocytoma	I
6	10	Male	Medulloblastoma	IV
7	10	Male	Medulloblastoma	IV
8	11	Female	Subependymal giant cell Astrocytoma	I
9	11	Male	Pleomorphic Xanthoastrocytoma	II
10	11	Male	Pilomyxoid Astrocytoma	II
11	14	Female	Craniopharyngioma	I
12	17	Female	Diffuse Astrocytoma-Gemistocytic type	II
13	17	Male	Craniopharyngioma	I
14	18	Female	Schwannoma	I

Figure 3: Gender distribution of CNS tumors

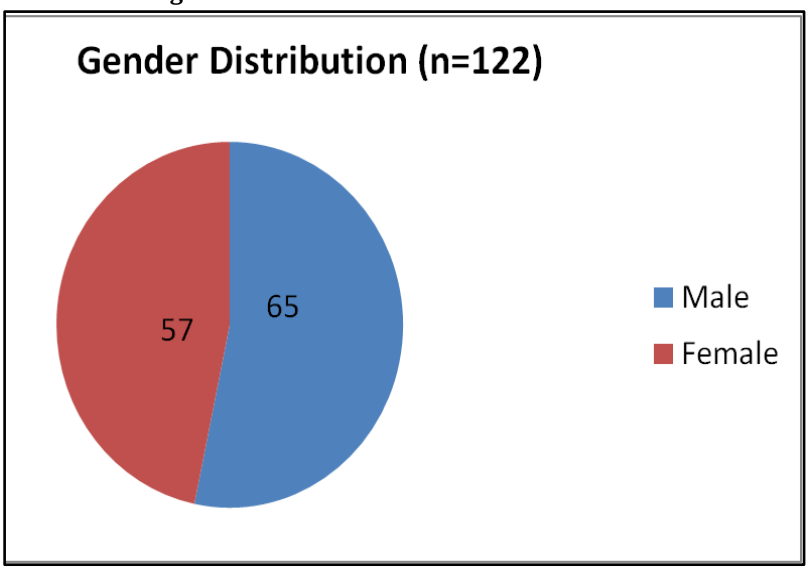


Table 2: Distribution of CNS tumors based on site

Site of tumour	No of cases	Site of tumour	No of cases
Frontal	15	Cerebellar	5
Temporal	6	Corpus callosum	2
Parietal	9	Thalamus	2
Occipital	1	Tentorium	2
Fronto-Temporal	2	CP Angle	14

Fronto-parietal	**5**	**Tentorium**	**2**
Fronto-occipital	**3**	**Clival**	**1**
Fronto-tempero-parietal	**2**	**Sphenoid**	**2**
Tempero-parieto-occipital	**2**	**Sellar & Suprasellar**	**2**
Parasaggital Frontal	**2**	**Posterior fossa**	**1**
Intraventricular	**3**	**Pterygoid cavity**	**1**

Table 3: Distribution of CNS tumors based on histological entities and WHO Grade

Histological diagnosis	No of cases	Grade	Histological diagnosis	No of cases	Grade
Diffuse Astrocytic & Oligodendroglial Tumors	**n=52**		**Ependymal tuors**	**n=1**	
Diffuse Astrocytoma NOS	**17**	**II**	**Ependymoma**	**1**	**II**
Anaplastic astrocytoma NOS	**5**	**III**	**Neuronal& mixed Neuronal glial tumors**	**n=1**	
Glioblastoma NOS	**25**	**IV**	**Central neurocytoma**	**1**	**II**
Diffuse Midline Glioma	**1**	**IV**	**Pineal region tumors**	**n=1**	
Oligodendroglioma NOS	**2**	**II**	**Pineoblastoma**	**1**	**IV**
Anaplastic Oligo-astrocytoma NOS	**2**	**III**	**Embryonal tumors**	**n=1**	
Other Astrocytic tumors	**n=9**		**Medulloblastoma**	**3**	**IV**
Pilocytic Astrocytoma	**3**	**I**	**Cranial & Paraspinal nerves**	**n=17**	
Pilomyxoid Astrocytoma	**2**	**II**	**Schwanoma**	**17**	**I**
Subependymal Astrocytoma	**2**	**I**	**Meningiomas**	**n=30**	
Plemorphic Xanthoastrocytoma	**2**	**II**	**Meningothelial Meningioma**	**12**	**I**
Ependymal tuors	**n=1**		**Fibroblastic Meningioma**	**2**	**I**
Ependymoma	**1**	**II**	**Transitional Meningioma**	**9**	**I**
Neuronal& mixed Neuronal glial tumors	**n=1**		**Psammomatous Meningioma**	**2**	**I**
Central neurocytoma	**1**	**II**	**Angiomatous Meningioma**	**3**	**I**
Pineal region tumors	**n=1**		**Atypical Meningioma**	**1**	**II**
Pineoblastoma	**1**	**IV**	**Anaplastic Meningioma**	**1**	**III**

Brain tumours were more common in males compared to females with a M:F ratio of 1.14:1. Distribution of CNS tumours in males and females is shown in [Fig-3].

Among the brain tumours the most common site involved was the frontal lobe of cerebrum [Table 2]. Some of the tumours involved more than one lobe of brain. The least affected was occipital lobe.

The most common histological entities in the current study were under the category Diffuse Astrocytic and Oligodendroglial tumors. A total of 59 cases (48.36%) were diagnosed followed by meningiomas (25.5%) and peripheral nerve sheath tumours (13.9%) [Table 3].

Diffuse astrocytic tumours showed a male predominance (38/59 cases) and WHO grade IV tumour-glioblastoma NOS showed a median age of 55 years. Most common site involved was the tempero- parietal lobe of cerebrum. Among the Astrocytic tumours, Glioblastoma NOS- grade IV was the most common histological subtype (48%) followed by Diffuse astrocytoma NOS, grade II (32.6%).

Meningiomas showed female predominance and the median age affected was 42 years. The most common sites were dura overlying frontal and parietal lobes of cerebrum. The most common histological subtype was meningothelial meningioma followed by transitional type. There were 28 cases (93.3%) of grade I meningioma,

The third common histological diagnoses were cranial and paraspinal tumours of which all were schwannomas. The most common site was cerebellopontine angle. Median age group affected was 44 years.

Figure 4: Central Neurocytoma H&E 10X

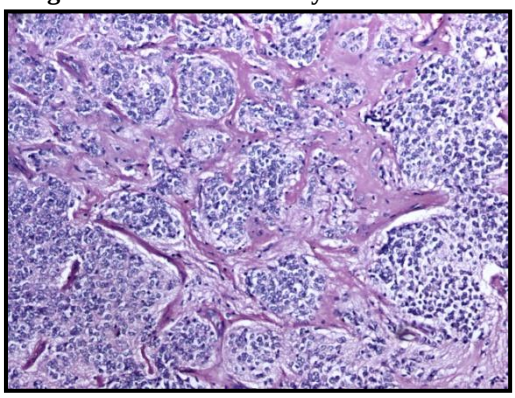


Figure 5: Craniopharyngioma H&E 10X

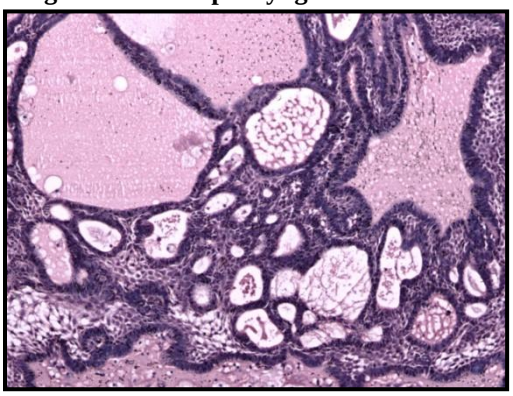


Figure 6: Medulloblastoma H&E 4X

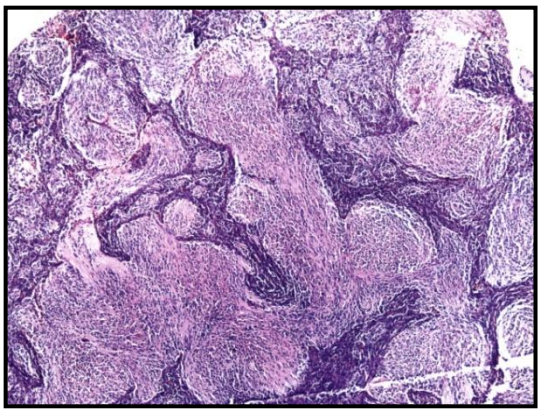


Figure 7: Psammomatous Meningioma H&E 10X

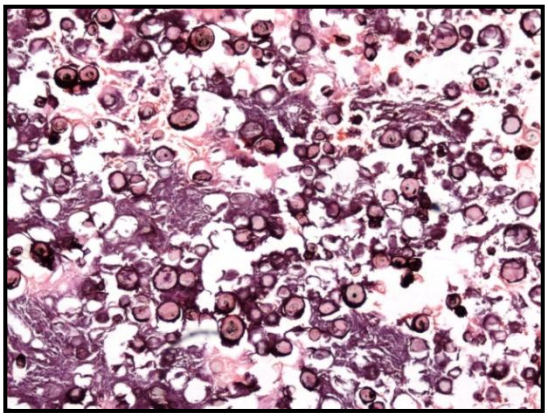
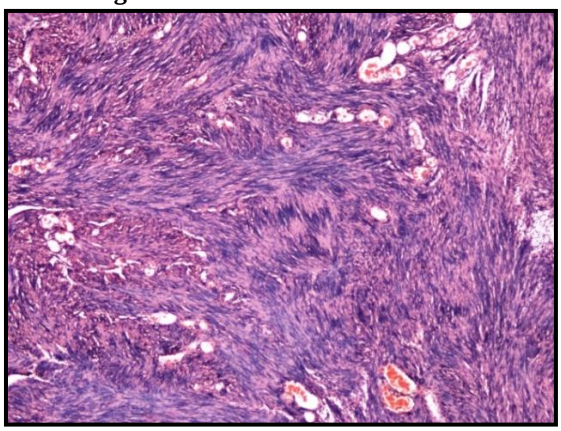
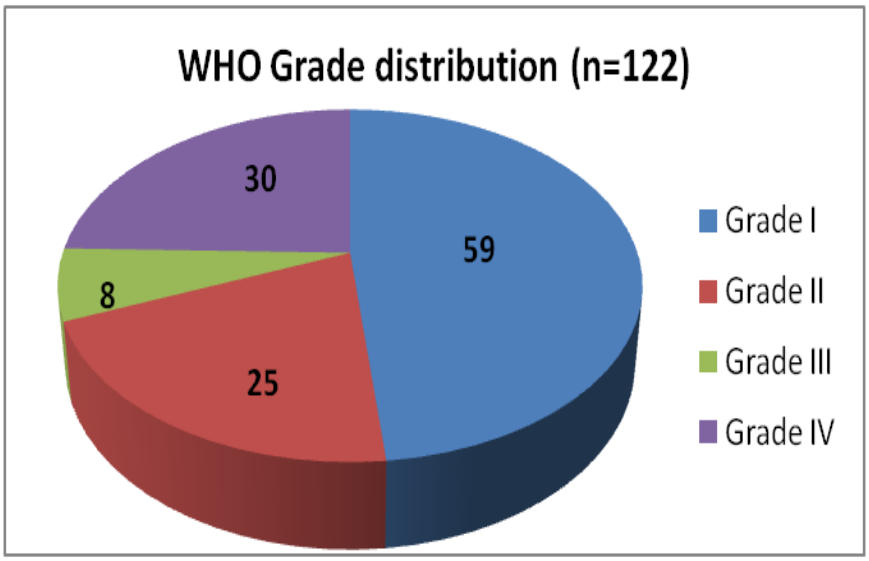


Figure 8: Schwannoma H&E 10X



Histological grading was done according to 2016 WHO classification. Most of the tumors were of WHO Grade I (48%) followed by Grade IV tumors (25%).

Figure 4: Distribution of CNS tumors according to WHO Grade



V. Discussion

The four year data of our hospital based study was analyzed. There is a gradual increase in tumors with increasing age, peaking in the age group 40-50 years [3,4,5] and decreased thereafter.[3] Fan et al,[6] also reported proportionally low frequencies of CNS tumors at bimodal age spectrum (below 10 years old and greater than 70 years). Dogar T et al[7] and Goyani BR et al[8] observed that most of the cases occurred in fourth decade in their study. Kaki RR et al[9] documented that CNS lesions were common in fifth decade in their study. Brain tumours showed a slight male preponderance (M:F ratio of 1.14:1) which was correlated with Jaiswal et al[10], Ghangoria et al.[11] Meningiomas being an exception with higher frequency in females.

Provost et al,[12] suggested the possible explanation for a higher frequency of gliomas in males may be due to specific occupational exposures. Deorah et al [13] opined that the observed gender variations may arise as a result of possible variabilties in the susceptibility of X and Y chromosomes to tumorigenic stimuli, while others postulated a protective effect of female sex hormones against brain tumors. In contrast, Kaki RR et al showed female predominance in their study.[9] Frontal lobe was the most common site of brain tumours in our study which was correlated with documentations of Jindal N et al[14]. Neuroepithelial tumors were commonest followed by meningeal tumors. Dogar T et al.,[7] Pant I et al [15]and Sunila et al[4] documented similar observations in their studies.

Diffuse astrocytic tumors were the most common diagnoses in our study and it occurred mostly in males. This is in concordance with observations by Jaiswal J et al.,[10] Ghanghoria S et al.,[11] The most common astrocytic tumour type was glioblastoma NOS, which occurred at the median age of 55 years.

Meningioma was the second most common histological entity in our study and it occurred mostly in females. This observation was correlated with Jat KC et al[3], Sunila et al[4], and Masoodi T et al.[16] The most common histological subtype was meningothelial meningioma followed by transitional meningioma.

WHO Grade I tumors constituted the most common primary neoplastic CNS lesions in our study followed by Grade IV tumors which was correlated with Sunila et al,[4] Ghangoria el al.[11] Jat KC et al. [3]

Comparison of data on brain tumours in adults with other recent studies has been presented in Table 4.

Table 4:Comparision of variables with other recent studies

Variables	Present Study	Jat KC et al.,[3]	Sunila et al.,[4]	Ghangoria S et al.,[11]	T.Masoodi et al.,[16]
Type of study	Hospital based	Hospital based	Hospital based	Hospital based	Hospital based
No. of cases	122	59	88	65	106
M:F ratio	1.14:1	1.8:1	1:1.4	1:0.86	1.12:1
Most common age group	41-50 Yrs	41-50 Yrs	40-50 yrs	31-40yrs	31-40yrs
Most common site	Frontal	Frontal	Frontal	Fronto-parietal	Frontal
Histological Diagnosis	Astrocytic tumors (41.4%) Meningioma (24.3%)	Astrocytoma(52.5%) Meningioma(22.03%)	Neuroepithelial tumors (33%) Meningioma(22.7%)	Meningioma(41.5%) Astrocytoma(24.6%)	Astrocytoma (41.5%) Meningioma (19.81%)
WHO Grade	Grade I (48%) Grade IV (25%)	Grade I (32.7%) Grade IV (32.7%)	Grade I (63.6%) Grade IV (19.6%)	Grade I (63%) Grade III (12%)	NA

Limitations:

The study conducted was a single-centre retrospective analysis and hence the data is not representative of the national epidemiology of CNS tumours. Our hospital being a government institution caters mainly the lower socioeconomic class in the society, limiting the number of cases included in the study owing to the hospital bias.

VI. Conclusion

Population based studies are more effective to know the actual tumour incidence in the population under study as compared to hospital based data. A comprehensive database is a dream for developing countries due to the financial constraints. In this context these types of studies give a glimpse of the representative incidence of various types of CNS tumors in our region. Histopathology is the gold standard method for diagnosis, typing and grading of CNS tumors especially in centers lacking molecular analysis thereby aiding in therapy and prognostication. Over all the age and gender distribution, predominant site involved, histological pattern and WHO grading of primary CNS tumours in our cohort paralleled with the national data.

References

[1]. Yeole BB. Trends in the brain cancer incidence in India. Asian Pac J Cancer Prev.2008;9:267-70.

[2]. Louis DN, Perry A, Reifenberger G, Von Deimling A, Figarella-Branger D, Cavenee WK, et al. The 2016 World Health Organisation classification of tumours of the central nervous system: a summary. Acta Neuropathol. 2016;131:803-20

[3]. Jat KC, Vyas SP, Bihari NA, Mehra K. Central nervous system tumors: a histopathological study. Int J Res Med Sci 2016;4: 1539-45.

[4]. Sunila, Kumarguru. B.N., T S Vasan, Manjunath. G.V. Space occupying lesions of central nervous system: A radiological-histopathological correlation study. Indian Journal of Pathology and Oncology, April - June, 2018;5(2): 202 – 207.

[5]. Renu Thambi et al., Hospital based Seven Year Histopathological Analysis of Brain TumoursJournal of Clinical and Diagnostic Research. 2017 Jun, Vol-11(6): EC05-EC08

[6]. Fan K, Pezeshkpour GH. Ethnic Distribution of Primary Central Nervous System Tumors in Washington, DC, 1971 to 1985. J NatI Med Assoc. 1992;84(10):858-63.

[7]. Dogar T, Imran AA, Hasan M, Jaffar R, Bajwa R, Qureshi ID, "Space occupying lesions of central nervous system: A radiological and Histopathological Correlation" Biomedica (2015) 31,15-20.

[8]. Goyani BR, Ukani BV, Naik P, Bhagat H, Vadel MK, Sheth R, "A Study on role of MRI in intracranial space occupying lesions" Natl J Med Res (2015) 5, 18-21.

[9]. Kaki RR, Anuradha B, Rani BS, Rao KS, Kusumalatha P, Sathyasuneetha, "Imaging of intracranial space occupying lesions- A prospective study in a tertiary care centre- GGH, Kakinada" A.P. J Evid Based Med Healthc (2017) 4, 617-23.

[10]. Jaiswal J, Shastry AH, Ramesh A, Chickabasaviah YT Arimappamagan A, Santosh V. Spectrum of primary intracranial tumours at a tertiary care neurological institute: A hospital based brain tumour registry. Neurol India. 2016;64:494-501.

[11]. Ghanghoria S, Mehar R, Kulkarni CV, Mittal M, Yadav A, Patidar H. Retrospective histological analysis of CNS tumours – A 5 year study. Int J Med Sci Public Health. 2014;3:1205-07.

[12]. Provost D, Cantagrel A, Lebailly P, Jaffre A, Loyant V, Loiseau H, et al. Brain tumors and exposure to pesticides: a case–control study in southwestern France Occup Environ Med. 2007;64:509-14.
[13]. Deorah S, Lynch CF, Sibenaller ZA, Ryken TC. Trends in brain cancer incidence and survival in the United States: Surveillance, Epidemiology, and End Results Program, 1973 to 2001. Neurosurg Focus. 2000;20(4):1-7.
[14]. Jindal N, Verma SR, Gupta PK, Mital M, "Imaging of Intracranial Space Occupying Lesion: A prospective Study in a tertiary care centre in North India" IOSR Journal of Dental and Medical Sciences (2016) 15,34-41.
[15]. Pant I, Chaturvedi S, Jha DK, Kumari R, Parteki S, "Central nervous system tumors: Radiologic pathologic correlation and diagnostic approach" J Neurosci Rural Pract" (2015) 6, 191–7.
[16]. Tamkeen Masoodi, Ram Kumar Gupta, J. P. Singh, Arvind Khajuria. Pattern of central nervous system neoplasms: a study of 106 cases. JK- Practitioner Vol.17, No. 4 October-December 2012.

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