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Spectrum of Central Nervous System Tumours at Tertiary Care Centre in Nepal

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ABSTRACT

Introduction

Most of the Central Nervous System tumors are benign. There is increase in the incidence in recent days which might be due to improved diagnosis with advancement in the ancillary studies. This study aims to provide a single centre histopathological spectrum of tumor of CNS.

Methods

This is a retrospective cross-sectional study of 138 cases of CNS tumors managed surgically in the department of neurosurgery from 2017 to 2020.All the histological subtypes and grading were reviewed. Data of the study population were analysed using SPSS version 25 and Microsoft excel. All the patients were classified as per the 2007 World Health Organization classification of central nervous system tumors.

Results

A total of 138 cases were analysed.One hundred and thirteen constitutes brain tumors and remaining 25 constitute the spinal tumors. Of the total cases, 132 were primary CNS tumor and remaining six were secondary CNS tumor. In cranial, 61 (44.2%) were extra axial tumors. There were 122 low grade tumor and remaining 16 were high grade tumors. Tumors of neuroepithelial origin were the most common 54 (38.9%) CNS tumors followed by meningiothelial tumors 36 (26.0%).Tumor were equally distributed in both the sex.Mean age of study population was 37.38 years ranging from 0.5 years to 75 years.

Conclusions

The present study concludes that the most common CNS tumour at our centre were neuroepithelial tumor mainly pilocytic astrocytoma followed by meningothelial.

Keywords: brain tumour; WHO tumor classification; meningioma; pilocytic astrocytoma

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INTRODUCTION

The burden of cancer is increasing worldwide and with use of advanced diagnostic modalities tumors incidence in on rise.[1] Even though CNS tumors accounts only 2% of malignancy, it imparts huge morbidity and mortality affecting young and middle aged population.[2] As there is no effective national CNS tumor registry in Nepal; the importance of descriptive data on the full spectrum of primary CNS tumors has been previously recognized.[3] In developing countries like Nepal due to the privation of complete registration of newly diagnosed cases with local cancer registries, the precise tumor burden of such diseases goes unnoticed and underestimated. Hence hospital based cancer registration can provides an essential base for cancer control, providing information not only on its incidence and survival but also helps in facilitating confirmation of effectiveness of interventions thus improving outcome. The Present study aims to evaluate and provide overview of descriptive epidemiology of CNS tumours in a tertiary care centre over four year duration as well as to highlight the incidence and the histological spectrum of CNS lesions in a tertiary care hospital in Nepal.

METHODS

The is a retrospective cross-sectional study conducted in the department of Neurosurgery and Pathology at Nobel Medical College and Teaching Hospital ,Biratnagar Nepal after the ethical clearance from the institutional review committee of the Nobel Medical college and teaching hospital. All the relevant records of computerized histopathology laboratory reports were retrieved from the laboratory information from 2017 to 2020. The variables transferred into the database with histopathology number, name, age, histopathological diagnoses, site of the tumor and tumor grade. The histologically proven CNS tumor either primary or metastatic was included.

The diagnoses were made on histological examination of the processed tissue. The tissue was processed in automated tissue processor as per standard protocol.[4] The slides were stained with haematoxylin and eosin as per standard protocol.[5] Finally, the slides were examined under microscope and histopathological findings were noted. All cases were confirmed applying WHO classification (2007)[6]. Incorporating the immunohistochemistry and molecular markers in the present study was not done as it was not routine practice at our centre. The baseline epidemiological characteristics of study population, frequency of tumors, and their site were analysed. Data obtained were analysed using SPSS 25.0 and Microsoft Excel 2010 and result was constructed using graphs.

RESULTS

During the study period, a total of 138 cases were studies. There were 113 cranial and 25 spinal tumor cases. Of the study population, 132 (95.8%) case had primary CNS tumor and remaining 6 (4.2%) were secondaries/metastatic lesions. In the cranial tumor, 44.2% (n=61) were extra axial tumor. Of the total study population, 122 (87.840%) subjects were low grade tumor and remaining 16 (11.52 %) were higher WHO grade tumor. Supratentorial tumor constituted of 69.9% of the study population. There was no sex preponderance in the present study with male to female ratio of 1:1.

Gender

There was no difference in the sex of study population. There were 69 cases in each sex comprising the male to female ratio of 1:1. The mean age of study population was 37.48year ranging from half year to more than 75 years. The maximum number of study population were between 30-39 year which consists of 22.5 %(n=31).

Clinical Presentation

Among all the cases presented, headache was the commonest clinical feature 22.55 %(n=31) followed by seizure.

Table1. Clinical features of the study population		
Clinical Features	**Frequency (n)**	**Percentage (%)**
Headache	31	22.5
Seizure	22	15.9
Visual Impairment	22	15.9
Focal weakness /Paresis /Plegia/Weakness	19	13.7
Back Pain	10	7.2
Ataxia	8	5.8
Decreased Level of consciousness	8	5.8
Hearing Problem	5	3.6
Vomiting	3	2.2
Swelling	3	2.2
Speech Problem	2	1.4
Bowel &Bladder Symptoms	1	.7

Clinical findings

The most common clinical finding in the present study was focal deficits 29.6 % (n = 41) followed by visual field defects. The other clinical findings were as in table 2.

Table 2. Clinical findings in the present study		
Clinical Findings	**Frequency (n)**	**Percentage (%)**
Paresis /focal Neurological deficits/CN deficits	41	29.6
Visual field defects	21	15.2
Memory disturbance	17	12.3
Papilledema	16	11.6
Gait Disturbance	11	8.0
Altered consciousness	7	5.1
Nystagmus	4	2.9
Aphasia	4	2.9
Clonus	4	2.9
Lump	3	2.2
Hearing defects	2	1.4
Foot drop	1	0.7

Radiological findings

Among all the cases, 52.9% (n=73) were homogenous on either Computed tomography or magnetic resonance imaging and 44.2% (n=61) were heterogeneous in nature. Three cases had calcification and one case had no enhancement at all.

Grades of Tumor

Grading of the tumor in the present study was done as per the WHO-2007 criteria. Immunohistochemistry was not possible in all the cases due to resource constrain. Table 3 shows the WHO grades of the tumor.

Table 3. WHO grading of the CNS tumor in the present study		
Grades	**Frequency**	**Percentage**
WHO-I	100	72.5
WHO-II	22	15.4
WHO-III	1	0.7
WHO-IV	15	10.9
Total	138	100.0

Tumor Location

In the present study, there were 96 supratentorial tumor, 15 was infratentorial. The other location of the tumor was as shown in the table 4.

Table 4. Location of tumor in the present study		
Site of tumor	**Frequency**	**Percentage**
Supra Tentorial	96	69.6
Infra Tentorial	15	10.9
Intradural extramedullary	13	9.4
Intradural intramedullary	10	7.2
Extradural	3	2.2
Scalp	1	0.7

Histological diagnosis

Table 5 shows the histological diagnosis of the CNS tumor in the present study based on WHO-2007 classification

Table 5. Histological diagnosis of tumor in present study

Histological types	Frequency(n)	Percentage (%)
1.TUMOR OR NEUROEPITHELIAL ORIGIN (54)		
I. Astrocytic Tumor		
Pilocytic Astrocytoma	14	10.1
Anaplastic Astrocytoma	1	0.7
Subependymal Giant Cell astrocytoma (SEGA)	1	0.7
Diffuse Astrocytoma (Fibrillary astrocytoma)	7	5.0
Glioblastoma Multiforme (Giant Cell Glioblastoma)	6	4.3
II. Oligodendroglial tumor		
Oligodendroglioma	8	5.8
III. Oligoastrocytic Tumor		
Oligoastroytoma	3	2.2
IV. Ependymal Tumors		
Ependymoma		
Cellular	4	2.9
Papillary	5	3.6
V. Embryonal Tumors		
Medulloblastoma (Extensive)	3	2.1
VI. Neuronal and mixed neuronal-glial tumors		
Extra ventricular Neurocytoma	1	0.7
Paraganglioma	1	0.7
2. TUMORS OF MENINGES (Cranial +Spinal)		
I. Tumors of the meningothelial cells (36)		
Meningiomas		
Meningothelial	20	14.5
Transitional	9	6.5
Psammomatous	1	0.7
Fibrous	5	3.6
Atypical Meningioma	1	0.7
II. Mesenchymal Tumor (2)		
Dorsal Intramedullary Lipoma	1	0.7
Left Frontal Osteoma	1	0.7
III. Other neoplasm related to the meninges (2)		
Hemangioblastoma	2	1.4
3. TUMORS OF THE SELLAR REGION (20)		
Craniopharyngioma		
Adamantinomatous	3	2.2

Papillary	3	2.2
Pituitary Adenoma	14	10.1
4. SPINAL (8)		
Schwannoma	8	5.8
5. METASTATIC TUMOR (6)		
Papillary Adenocarcinoma	2	1.4
Sarcoma	1	0.7
Lymphoma	1	0.7
Metastasis of unknown primary	2	
6.TUMORS OF CRANIAL AND PARASPINAL NERVES (4)		
Acoustic Schwannoma	4	
7. GERM CELL TUMOR (3)		
Mixed Germ Cell Tumor	1	0.7
Choriocarcinoma	1	0.7
Teratoma (Mature)	1	0.7
8.Others (3)		
Aneurysmal Bone Cyst	1	0.7
Colloid Cyst of Third ventricle	1	0.7
Giant cell Tumor	1	0.7

Treatment

Gross total excision of the tumor was achieved in 72.5 % (n=100) cases. Complete excision was achieved in 21.0% (n=29). Tumor decompression and navigation guided biopsy was done in 9 cases. Those with higher grade tumor (n=16, 11.52%) were referred for adjuvant therapy.

Complications

Overall complications rate was 23.2%. The most common complication encountered in the present study was chest infection which was 4.3 %(n=6). Other complication seen in the present study was as shown in table 6.

Table 6. Complications in the present study

Complications	Frequency (n)	Percentage (%)
Chest Infection	6	4.3
Pseudo meningocele	4	2.9
Lower CN Palsy	4	2.9
Hydrocephalus	3	2.2
UTI	3	2.2
Death	3	2.2
Seizure	2	1.4
Meningitis	2	1.4
Worsen Neurological status	1	0.7
Deep vein thrombosis	1	0.7
Significant Limb weakness	1	0.7

Modified Ranking Scale

Majority of the study population who completed 1 year of follow up had favourable outcome. In the study,21 (15.2% had mRS of zero, eighty eight (63.8 %) had mRS score of 1,seventeen (12.3%) had mRS of 2 ,two (1.4% had mRS of 3,mRs 4 and 5 were seen in one patient each. There were five (3.65%) death. Three patients did not complete the one year follow up.

DISCUSSION

The exact impacts of CNS tumors on health care system of developing nations are rarely available. Countries like Nepal where national registry of cancer cases data is not being followed obtaining data on CNS tumor is difficult. So it is extremely difficult to get the exact incidence of such devastating condition and cases are even underreported. In this context, even a retrospective review of spectrum of CNS tumours at tertiary care centre is expected to aid future research and unveil clinical profile of CNS tumor. This will help health professionals for screening investigations and possible therapeutic options in various neoplastic and non-neoplastic lesions of CNS. The present study shows that the 138 cases of CNS lesions which share several features that are common with other published series. It is therefore important to know about the distribution of CNS tumors both at local and national level to allocate the health-care resources appropriately.[7-8]

In the present study there was no sex preponderance. The male to female ratio was 1:1. In other studies, somewhere male were predominantly affected and somewhere female were predominantly affected. In a study by Butte et al and Ghanghoria et al it was found that male to female ratio was 1.7:1 and 1:0.86, respectively.[9,10] A study by Nibhoria et al the male to female ratio was 1:1.2.[11] and a study by Das et al from Singapore there was female preponderance which comprised of 52.6%.[12]. The maximum number of study population in the present study were between 20-39 year (36.3%, n=50) which is consistent with the study conducted by Krishna treya et al, where commonest age group of CNS tumor were between 20-39 years.[13] In the present study, 16.7%(n=23) of study population were below 20 years old with significant histological diversity. This finding was in accordance to the study by Lee et al.[14]

In the present study, 81.9% (113) of CNS tumor comprised of Cranial tumor and 18.1% (25) tumors originated from the spine which is similar to the study done at other center in Nepal by Shrestha where the cranial and spinal tumor were 88.0% and 12.0% respectively.[15] Dorsal spine was the commonest location of spinal tumor which was in accordance to other studies by Shrestha et al and Masoodi et al.[15-16] Among all the histologically proven CNS tumor, 95.8% were primary CNS tumors and remaining 4.2% were metastatic lesion which is similar with the study done by Shrestha et al.[15]

The most common cell of origin of CNS tumor in the present study was neuroepithelial (38.88%) however the commonest histological diagnosis was meningothelial meningioma (14.5%). In the neuroepithelial cell origin pilocytic astrocytoma was the most common (10.1%) This result was in accordance with study result of Ghangoria et al[17]. In a study by Mollah et al astrocytoma were the most common CNS tumors followed by pituitary tumors and meningiomas.[18] Of the total case of CNS tumor 87.8 % were low grade tumor and 12.2 % were high grade tumor mainly glioblastoma multiforme followed by atypical meningioma.

CONCLUSIONS

The present study concludes that the most common CNS tumor is meningioma. Clinical presentation of CNS tumor is variable. Histological diagnosis in children is divergent. Commonest age's group of CNS tumor is 20-39 years. This study shows the current spectrum of CNS tumor at a tertiary care centre in Nepal. The result of the present study is expected to aid the future multicentric studies in the nation.

Limitations of study

This is a single centre retrospective study. Data presented here may not represent the national data, so multicentric, prospective observational study might help to produce the exact incidence and identify the real burden of CNS tumor.

Conflicts of interest

There are no conflicts of interest to be declared.

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