Original Article

J Nepal Health Res Counc 2020 Apr-Jun;18(47): 219-23

DOI: https://doi.org/10.33314/jnhrc.v18i2.1547

Histopathological Spectrum of Central Nervous System Tumors: an Experience at a Hospital in Nepal

Agya Shrestha,[1] Sharmila Parajuli,[2] Pratyush Shrestha,[3] Ranga Bahadur Basnet[2]

[1]Nepal Police Hospital Hospital, [2]Kathmandu Model Hospital, phect-NEPAL, [3]Upendra Devkota Memorial-National Institute of Neurological and Allied sciences, Kathmandu, Nepal

ABSTRACT

Background: More than half of Central Nervous System tumors are benign; however, they can cause substantial morbidity. The classification of central nervous system is vital for their varied outcomes and management. The objective of this study is to provide the histopathological spectrum of central nervous system tumors in a central hospital in Nepal.

Methods: The present study is a retrospective cross-sectional study conducted at Department of Pathology, Kathmandu Model Hospital, Kathmandu, Nepal from January 2010 to December 2017 of 162 cases of clinically diagnosed cases of central nervous system tumors. All patients were classified according to the World Health Organization classification of central nervous system tumors.

Results: Nine of these162 patients did not have any tumor. The most common categories of tumors were astrocytic and oligodendroglial tumors (39.2%), meningiomas (21.5%), cranial and para spinal tumors (15%), tumors of sellar region including pituitary adenoma (4.5%), and metastatic tumors (3.2%). Glioblastoma(51.6%) and diffuse astrocytoma (21.6%) were the most common astrocytic and oligodendroglial tumors. The most common site of tumors in the brain was frontal (14.37%) followed by temporal (10.45%) region in the brain and dorsal region in spine.

Conclusions: This study gives the current scenario of the epidemiology and clinicohistopathological aspects of different brain tumors as encountered in a tertiary level hospital in Kathmandu.

Keywords: Astrocytoma; central nervous system; cranial; meningioma; tumors.

INTRODUCTION

The chance that a person will develop malignant tumor of the brain or spinal cord in his/her lifetime is less than 1%.[1-2] Brain tumors are the most common cancer and the leading cause of cancer related deaths in children less than 14 years.[3]

Although more than half of these tumors are benign, they can cause substantial morbidity.[4] Low grade tumors have been found to progress to high grade tumors overtime.[5] The most common site for primary brain and CNS tumors is within meninges(37%). Most prevalent brain tumor types in children are pilocytic astrocytoma, malignant glioma, medulloblastoma, neuronal and mixed neuroglial tumors and ependymoma.[6]

The objective of our study is to provide descriptive epidemiology of the central nervous system tumor in a tertiary care hospital in central Nepal.

METHODS

The present study is a retrospective cross-sectional study conducted at Department of Pathology, Kathmandu Model Hospital, Kathmandu, Nepal. Record of computerized histopathology laboratory reports were retrieved from the laboratory information from January 2010 to December 2017. Ethical approval was granted by ethical committee of Public Health Concern Trust (PHECT)-Nepal. The cases in the study are both benign and malignant, belonging to both genders between the ages 1-80 years. The other CNS diseases including arteriovenous malformation, abscesses, cyst and reactive gliosis were excluded from the study.

Correspondence: Dr Agya Shrestha, Nepal Police Hospital Hospital, Kathmandu, Nepal. Email: agya1983@gmail.com, Phone: +9779841268281.

The diagnoses were made on histological examination of the processed tissue. The tissue was processed in automated tissue processor as per standard protocol.[7] The slides were stained with hematoxylin and eosin as per standard protocol.[8]

Finally, the slides were examined under microscope and histopathological findings were noted. All cases were confirmed applying WHO classification(2016).[9] However, we were not able to incorporate the immunohistochemistry and molecular markers in our study; as this was a retrospective study and over the years 2010 to 2017, immunohistochemistry was not a routine practice. The relative frequency of tumors, their site and distribution of age and sex were analyzed.

Data analysis was done using SPSS 20.0 and Microsoft Excel 2013 was used for the construction of graphs.

RESULTS

The patients' age ranged from 3years to 79 years. The mean age was 44.7 years. Most patients belonged to 5th decade of life followed by 3rd decade.

CNS tumors in pediatric age group (≤14 years) were clinically diagnosed in 12 out of 162 patients (7.4%). Of these 12 patients, one patient diagnosed to have a GBM clinically was histopathologically proven to have tuberculosis. Of the remaining 11 cases, 4 (36.4%) children had Ependymoma. The other CNS tumor in children were choroid plexus papilloma, craniopharyngioma, dermoid, pineal germinoma, hemangiopericytoma, pituitary adenoma and a CP angle schwannoma.

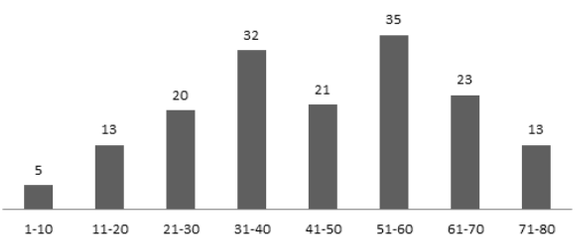

Figure 1. Age range of the patients.

Out of 162 cases, 69(43%) were females and 93(57%) were males. In the female population the most common CNS tumor was Meningioma (31.88%) followed by diffuse astrocytic and oligodendroglial tumors (30.43%) and cranial and paraspinal tumors (13.04%). WHO has classified Schwannomas and Neurofibromas in cerebello-pontine angle and spine as cranial and paraspinal tumors.

In the male population diffuse astrocytic and oligodendroglial tumors were the most common CNS tumors (43.01%) followd by cranial and paraspinal tumors(15.05%) and meningiomas (11.83%)

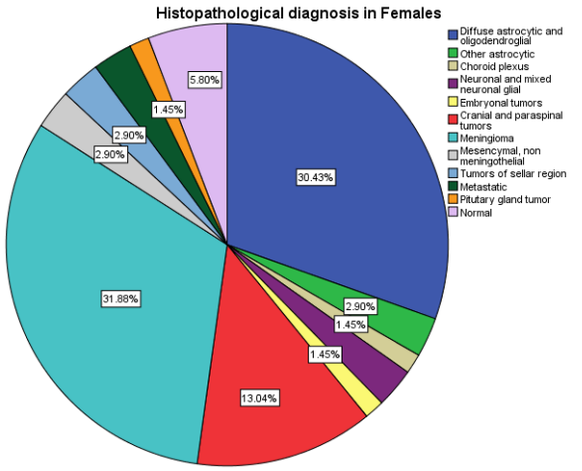

Figure 2. CNS tumors in the female population.

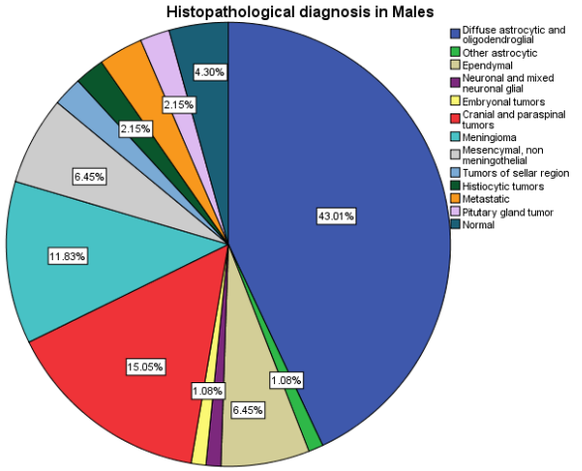

Figure 3. CNS tumors in the male population.

162 patients clinically diagnosed as CNS tumors were studied histopathologically, of which one specimen yielded tuberculosis, two reactive gliosis and six had normal brain tissue. Hence in 153 patients with with CNS tumors, 148 cases had primary CNS tumor and 5 had metastatic tumor(3.38%). Adenocarcinoma was the most common metastatic tumor.

Of all CNS tumors, 88% was of cranial origin and 12% were of spinal origin. The tumors were categorized as astrocytic and oligodendroglial tumor (39.86%), meningioma (21.56%), cranial and para spinal tumors (15.03%), mesenchymal-non meningothelial tumors (5.22%), metastatic tumors (3.38%), ependymal tumors (3.92%)tumors of sellar region (2.61%), pituitary gland tumors (1.96%), other astrocytic tumors (1.96%), neuronal and mixed neuronal glial (1.96%), embroyonal tumors (1.3%), choroid plexus tumor (0.65%) histiocytic tumors (1.3%), and choroid plexus tumor (0.65%)

Astrocytic and oligodendroglial tumors, the commonest tumors, were seen in the 5th and 2nd decade of life. The most common subtype of astrocytic and oligodendroglial tumors was glioblastoma 50.8 % followed by diffuse astrocytoma (21.3%) and oligoastrocytoma (8.2%).

Table1. Types of diffuse astrocytic and Oligodendroglial tumors

Diffuse astrocytic and Oligodendroglial tumors	No. of Cases (Percentage)
Diffuse astrocytoma	13 (21.3%)
Anaplastic astrocytoma	3 (4.9%)
Glioblastoma	31 (50.8%)
Oligodendroglioma	4 (6.6%)
Oligoastrocytoma	5 (8.2%)
Anaplastic Oligoastrocytoma	3 (4.9%)
Gliosarcoma	2 (3.3%)
Total	61

Meningiomas were the second most common tumors. Transtional meningioma was the commonest subgroup(45.5%) followed by meningothelial meningioma (21.2%). All meningiomas were WHO grade I except one which was WHO grade II.

Table 2. Types of meningeal tumors.

Type of meningioma	Number (percentage)
Transtional	15 (45.5%)
Microcystic	1 (3%)
Psammomatous	3 (9%)
Angiomatous	1 (3%)
Chordoid	1 (3%)
Fibroblastic	1 (3%)
Fibrous	1 (3%)
Lipomatous	1 (3%)
Lymphoplasmacyte rich	1 (3%)
Metaplastic	1 (3%)
Meningothelial	7 (21.2%)
Total	33

Of the total CNS tumors, 88% were in the brain and 12 % in the spine. The most common site of tumors in the brain was frontal (14.37%) followed by temporal (10.45%) region. Frontoparietal and temporoparietal tumors were the third most common sites in brain (both 9.15%). In the spine the most common site was the dorsal spine (9.8%) Of these spinal tumors, 8 (40%) were schwannomas and 6 (30%) were neurofibromas.

DISCUSSION

In the present study, of all clinically diagnosed cases of CNS tumors, 9 did not have any evidence of tumor. Most patients in our study belonged to age group between 51-60 years followed by 31-40 years. Many studies showed patients with CNS tumors between the age 31-50 years which was similar to our study.[5, 10-12] Many studies showed that the incidence of CNS tumors was more in the male population than the female. In our study too, 57% of the patients were males and the rest females.[10-15] The incidence of menigiomas is, however, more in females. In our study, the incidence of meningiomas was 31.88% in females and 11.83% in males. This finding has been highlighted in most studies including that of Ghangoria et al and Ahsan et al.[5, 10]

In our study, 88% of cases were of cranial origin and 12% were of spinal origin. Hussain et al had 7.35% spinal tumors in his series with neurofibroma being the commonest.[12] The most common spinal tumors in our series were schwannomas. Dorsal region was the most common site of CNS tumors in the spine. Masoodi et al also found dorsal region of spine as the commonest site in spine in their study.[14]

The most common site of tumors in the brain, in our study was frontal followed by temporal region. Mondal et al and Masoodi et al had frontal region as the commonest site of tumour in their studies.[11,14] Ghangoria et al and Aryal et al had frontoparietal region as the commonest site.[5]

Of all histologically diagnosed cases of CNS tumors, 148 were primary CNS tumors and 5 (3.38%) were metastatic tumors. In adults, in studies worldwide, metastatic tumors of the brain are more common than primary brain tumors.[1] An estimated 24-45% of all cancer patients in the United States have brain metastases. [16] Of all patients with brain metastasis, slightly less than 10% are diagnosed even before the primary cancer is diagnosed These brain tumors are diagnosed incidentally when patients are evaluated for headache with MR imaging.[2] In Nepal patients with brain metastasis are sometimes not given the option of surgical management due to its poor prognosis. So, despite being a common tumor, it was not found to be predominant in our study.

The most common histologically diagnosed tumor was diffuse astrocytic and oligodendroglaial tumors followed by meningioma. Similar results were seen in other studies where neuroepithelial tumors were the most common followed by meningioma.[10-11,17-18] However Ghangoria S et al found meningiomas as the most common tumor.[5] In the series by Mollah N et al, astrocytic tumors were the most common tumors followed by pituitary tumors, and meningiomas came third.[15]

Of all diffuse astrocytic and oligodendroglial tumors,

glioblastoma was the most common tumor followed by diffuse astrocytoma. Ahsan et al, Hashmi et al and Hussain et al also had glioblastoma as the most common type of glial tumors.[10,12,19] WHO grade IV tumor was the most common type of astrocytic and oligodendroglial tumors in our study, whereas, Hashmi et al had more of grade II/III tumors.[19] The second most common group of tumors were meningiomas in our study, and all but one were WHO grade I(96.9%). Ahsan et al had 84.3% grade I meningioma in their series.[19] Low grade tumors, including low grade astrocytoma, oligodendroglioma and mixed tumors, have been found overtime to progress to high grade tumors.[5] The greater incidence of high grade tumors in our series could be due to late presentation and ignorance of the clinical symptoms related to the CNS tumors, among the general public

Our study had a few limitations. Since it is a retrospective study, immunohistochemical and molecular studies could not be performed and it is a single institution study.

CONCLUSIONS

Histopathological diagnosis is necessary for the definitive diagnosis of tumors. This study provides the current scenario of clinicohistopathological aspects of different CNS tumors in the Nepalese population.

REFERENCES

1. American Cancer Society. Types of brain and spinal cord tumors in adults [Internet]. 2016 [cited 7 July, 2017]. Available from: https://www.cancer.org/cancer/brain-spinal-cord-tumors-adults/about/types-of-brain-tumors.html
2. American Brain Tumor Association. *Brain tumor statistics* [Internet]. 2017 [cited 7 July, 2017]. Available from: http://www.abta.org/about-us/news/brain-tumor-statistics
3. Central Brain Tumor Registry of the United States: Source for incidence and mortality data: Surveillance, Epidemiology, and End Results (SEER) Program and the National Center for Health Statistics. United States: National center for health statistics;[Link]
4. Buckner JC, Brown PD, O'Neill BP, Meyer FB, Wetmore CJ, Uhm JH. Central nervous system tumors. Mayo Clin Proc. 2007;82(10):1271-86.[DOI][ScienceDirect]
5. Ghanghoria S, Mehar R, Kulkarni CV, Mittal M, Yadav A, Patidar H. Retrospective histological analysis of CNS tumors – A 5 year study. Int J Med Sci Public Health. 2014;3:1205-7.[FullText]
6. National Brain Tumor Society. Tumor types: Understanding brain tumors [Internet]. 2017 [cited 7 July, 2017]. Available from: http://braintumor.org/brain-tumor-information/understanding-brain-tumors/tumor-types
7. Histopathology techniques. In: Chakraborty P, Chakraborty G, editors. Practical pathology, 1st ed. Kolkata: New central book agency:1998. p.294-300.
8. Stevens A, Wilson I. The hematoxylins and eosin. In: Bancroft JD, Stevens A, Turner DR, editors. Theory and practice of histological techniques, 4th edition. Hong Kong: Chruchill livingstone;1996. p.104-5.
9. Louis DN, Perry A, Reifenberger G, von Deimling A, Figarella-Branger D, Cavenee WK, et al. The 2016 World Health Organization Classification of Tumors of the Central Nervous System: a summary. Acta Neuropathol. 2016;131(6):803-20.[FullText]
10. Ahsan J, Hashmi SN, Muhammad I, Ud Din H, Butt AM, Nazir S, et al. Spectrum of central nervous system tumors-A single center histopahological review of 761 cases over 5 years. J Ayub Med Coll Abbottabad. 2015;27(1):81-4.[FullText]
11. Mondal S, Pradhan R, Pal S, Biswas B, Banerjee A, Bhattacharyya D. Clinicopathological pattern of brain tumors: A 3-year study in a tertiary care hospital in India. Clin Cancer Investig J. 2016;5(5):437-40.[FullText]
12. Hussain Z, Ghaffar A, Qasmi SA. Central Nervous System (CNS) Tumour Registry: A Single Neurosurgical Centre Experience of Four Years. Pak J Neurol Surg. 2016;20(1):20-5.[Link]
13. Ho CY, VandenBussche CJ, Huppman AR, Chaudhry R, Ali SZ. Cytomorphologic and clinicoradiologic analysis of primary nonhematologic central nervous system tumors with positive cerebrospinal fluid. Cancer Cytopathol. 2015 Feb;123(2):123-35.[DOI]
14. Masoodi T, Gupta RK, Singh JP, Khajuria A. Pattern of central nervous system neoplasms: A study of 106 cases. JK-Practitioner. 2012;17(4):42-6.[FullText]
15. Mollah N, Baki A, Afzal N, Hossen A. Clinical and Pathological Characteristics of Brain Tumor. Bangabandhu Sheikh Mujib Medical University Journal. 2010;3(2):68-71.[DOI]
16. Nussbaum ES, Djalilian HR, Cho KH, Hall WA. Brain metastases. Histology, multiplicity, surgery, and survival. Cancer. 1996;78(8):1781-8.[DOI]
17. Sajjad M, Shah H, Khan ZA, Ullah S. Histopathological pattern of intracranial tumors in a tertiary care hospital of Peshawar, Pakistan. Journal of Sheikh Zayed Medical College. 2016;7(1):909-12.

18. Aryal G. Histopathological pattern of central nervous system tumor: A three year retrospective study. Journal of Pathology of Nepal 2011;1(1):22 -5.[DOI]

19. Hashmi AA, Faridi N, Malik B, Edhi MM, Khurshid A, Khan M. Morphologic spectrum of glial tumors: an increased trend towards oligodendroglial tumors in Pakistan. Int Arch Med. 2014;7:33.[FullText]