Histomorphological Pattern of Childhood CNS Tumor: An Experience at National Institute of Neurosciences & Hospital, Bangladesh

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CNS tumors in childhood differ considerably from adult in term of geographic distribution, histological patterns, clinical and therapeutic aspects, prognosis and outcome. There is a paucity of study about the distribution pattern of CNS tumors in pediatric age group in Bangladesh. National Institute of Neurosciences & Hospital (NINS&H) is a tertiary health care hospital in Bangladesh dealing with the neurological diseases having a well developed Pediatric Neurosurgery department. The purpose of the present study was to see the histomorphological pattern of childhood CNS tumors and the frequency distribution in Bangladesh. We analyzed the data compiled from CNS lesions biopsied in Pediatric Neurosurgical department and reported from the Department of Neuropathology of NINS&H during the time period of June 2013 to April 2016. A total of 239 cases of pediatric CNS lesions were included in this study. 180 cases were CNS tumors and 59 were tumor like lesions which was not further analyzed. The mean age was 10.30±5.48 years. Most of the patients were in 10 to 15 years age group. A slight male predominance was seen. Out of 239 cases 140 were intracranial and 50 were spinal. There were (103, 43.5%) supratentorial lesions and (37, 15.6%) infratentorial lesions. Grade I tumor (39.3%) was most frequent followed by grade IV (14.6%). Within the grade I tumor, Pilocytic astrocytoma was the most common variant (33, 36.3%) followed by Craniopharyngioma. Medulloblastoma was the common tumor (13, 38.2%) in grade IV group followed by Central Primitive Neuroectodermal tumor (PNET). Supratentorial tumors were more common than infratentorial. Pilocytic astrocytoma was the commonest pediatric CNS tumor. Craniopharyngioma, Ependymoma, Medulloblastoma and PNET were next in frequency.

[Journal of Histopathology and Cytopathology, 2018 Jul; 2 (2):92-98]

Keywords: Childhood CNS tumor, pilocytic astrocytoma, medulloblastoma

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Introduction

Primary CNS lesions are a varied group of lesions occurring in brain and spinal region. It includes a wide variety of diseases ranging from neoplastic lesions to infectious diseases as well as some cystic lesions common in CNS.[1] Brain tumor in childhood differs considerably from adult in term of distribution, histological patterns, clinical and therapeutic aspects, prognosis and outcome.[2,3,4] The incidence of childhood brain tumors varies greatly throughout the world depending on its type. National Institute of Neurosciences & Hospital is the one of the referral centre in Bangladesh dealing with the neurological diseases both for pediatric and adult patients. Reports on the pattern of childhood CNS tumors in Bangladesh are rare. We analyzed the data compiled from CNS lesions biopsied in Neurosurgical Department and reported from the Department of Neuropathology of NINS&H during the time period of June 2013 to April 2016. Although exact incidence cannot be provided by a hospital based study, but the information derived from this study will be useful in showing pattern of childhood CNS tumors in our regions. It will have implications for future research, treatment and prognostic factors. It will provide information about the extent of diseases, address the weight of the problem and finally it will help to design the human resources and fund needed to face the problem. The etiology of CNS tumors is mostly unknown. Some CNS tumors have proven associations with some genetic and environmental factors.[3,4,5] So the study will be also helpful to decline the disease prevalence in our country by prenatal diagnosis and molecular treatment. The objectives of this study are to determine the histomorphological pattern of CNS lesions and the frequency distribution.

Methods

The present study is based on the data collected from the Neuropathology department of NINS &H. The study is a retrospective analytical study. The study included all the patients up to eighteen years of age having CNS lesions and has biopsy proven diagnosis during the period of June 2013 to April, 2016. Skin, soft tissue, bony tumors and tumor like lesions were excluded from the study. All the samples were stained by routine Hematoxyline & Eosin stain. Beside H& E stain, immunohistochemistry was performed in only selective cases where there was diagnostic dilemma. Histological diagnosis and grading of the tumor was based on the, "WHO classification of the tumor of the CNS" and other reference books of histopathology.[6,7,8,9]

Result

A total of 239 cases of pediatric CNS lesions biopsied in the Neurosurgical department of NINS&H were included in the study. The mean age at diagnosis was 10.30±5.48 years with age range of 3 months to 18 years. Children were stratified into four age groups: Group I (0-5); group 2 (5-10); group III (10-15); group IV (15-18) years. Most of the patients were in 10 to 15 years age group and least number of patients in 5 to 10 years.

Table I: Age distribution among the study population

Age Group	Frequency	Percent
Less Than 5 Years	60	25.1
5 to 10 Years	48	20.1
10 to 15 Years	82	34.3
More Than 15 Years	49	20.5
Total	239	100.0
Mean±SD (Range)	10.30±5.488 (1-18)	

The study shows a slight male predominance with a male to female ratio of 1.4:1.

Anatomical location of the lesions

In this study out of 239 cases 140 were intracranial and 50 were spinal. Exact site was not mentioned in 49 cases. There were (103, 43.5%) supratentorial lesions and (37, 15.6%) infratentorial lesions. Among the supratentorial location sellar lesions (28, 28%) were most common and in case of infratentorial site posterior fossa (24, 63.2%) lesions were commonest.

Histological types of the lesions

The tumors were sub grouped into grade I to IV according to WHO grading system. The most commonly encountered group was grade I tumor (39.3%) followed by grade IV (14.6%) and grade II(16.7%) There was only 4.4% of grade III tumor. In 7.2% cases tumor grade cannot be determined due to inadequate biopsy material, technical error, type of tumor and some other causes.

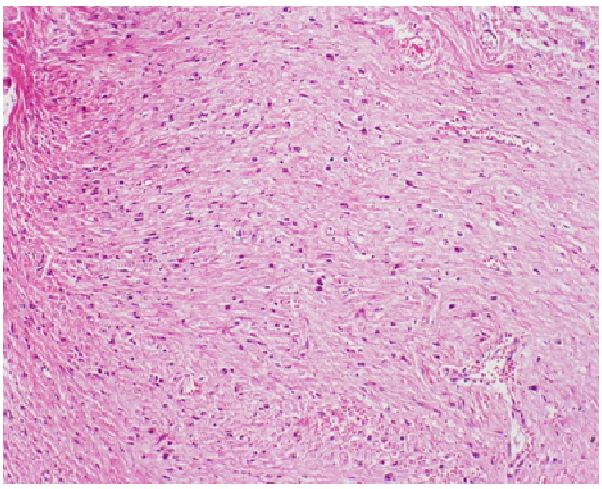
Pilocytic astrocytoma was the most common variant (33, 36.3%) followed by Craniopharyngioma(19,7.9%) and Ependymoma (17,7.1%). Medulloblastoma (13, 38.2%) and PNET (11,4.6%) was next in frequency which was grade IV tumor . Fibrillary astrocytoma(8,3.3%), Gemistocytic astrocytoma, Nerve sheath tumor, Meningioma, Hemangioma and other tumors were also found in pediatric age groups in different frequency. Even Glioblastoma(4,1.7%) was not uncommon in this age .

Table II: Distribution of Different Grades of Tumor

Grade of Tumour	Frequency	Percent
Grade I	94	52.2
Grade II	30	16.7
Grade III	8	4.4
Grade IV	35	19.4
Undetermined Grade	13	7.2
Total	180	100.0

Table III: Distribution of Different Tumors according to frequency

TYPES	Frequency	Percentage
Pilocytic astrocytoma	33	13.8%
Craniopharyngioma	19	7.9%
Ependymoma	17	7.1%
Medulloblastoma	13	5.4%
PNET	11	4.6%



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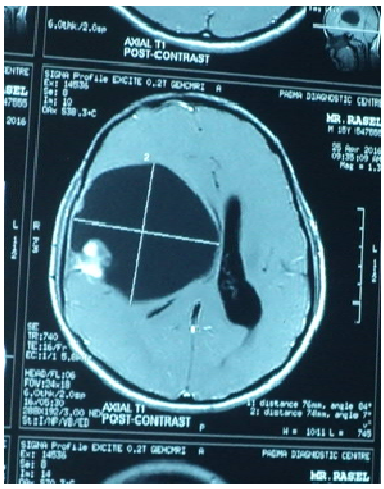

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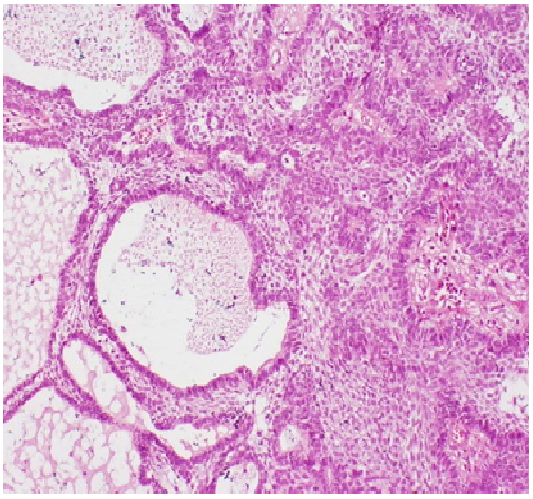
Fig 1A. Photomicrograph showing pilocytes and Rosenthal fibres in a case of Pilocytic astrocytoma.
1B. MRI showing hyperintense mural nodule with a large cyst



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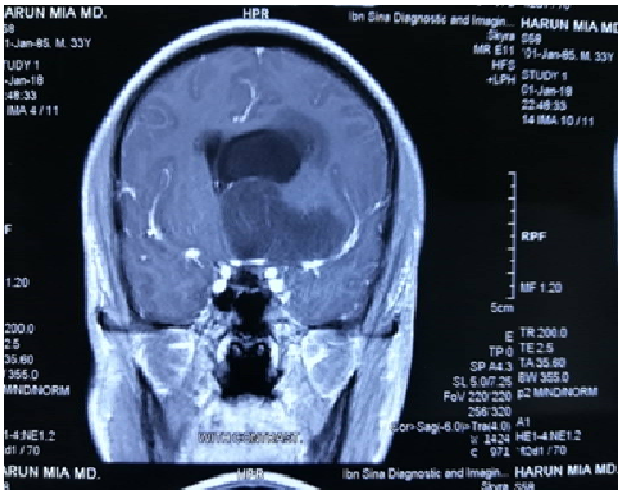
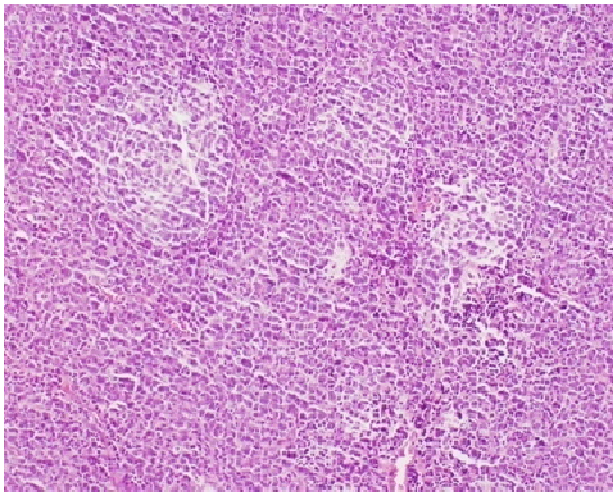
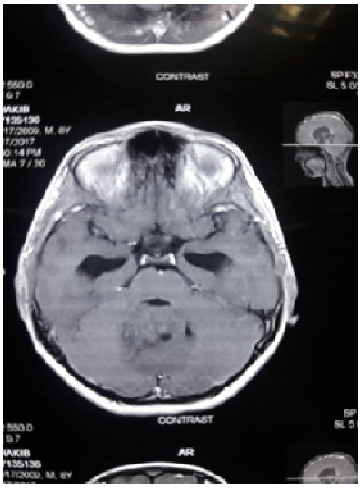


B

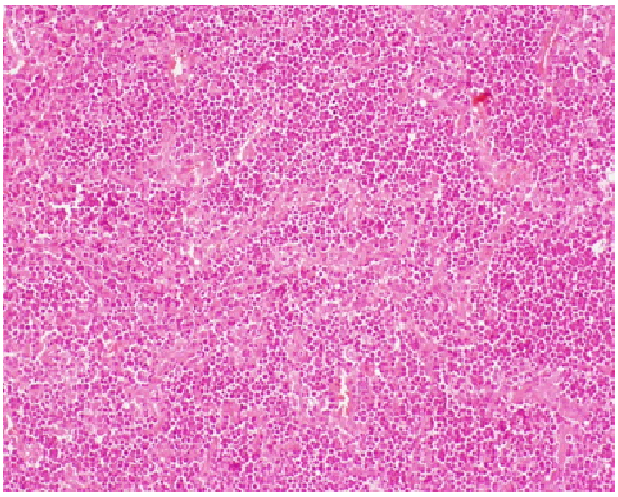
Fig 2A. Photomicrograph showing nests of squamous epithelial cells with peripheral palisading by columnar cells in a case of Craniopharyngioma.
2B. MRI showing cyst with hyperintense contrast enhancement in solid area.

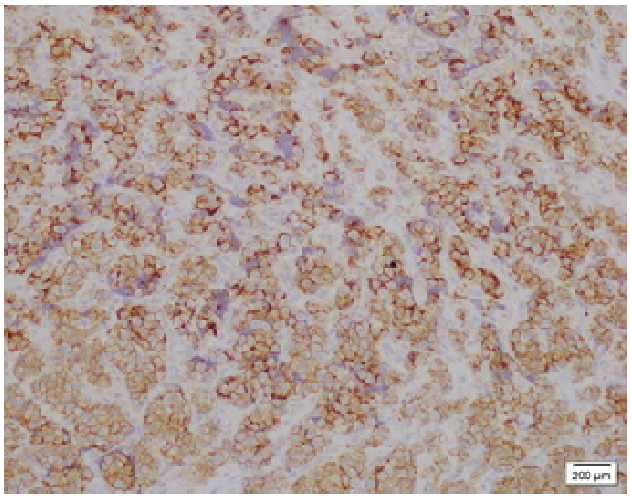




A **B**

Fig 3A. Photomicrograph showing nodules of undifferentiated ells with zones of reduced cellularity in a case of Medulloblastoma.
3B. MRI showing homogenous enhancement in posterior fossa





A **B**

Fig 4A. Photomicrograph showing sheets of poorly differentiated cells.
4B. Immunohistochemistry showing positive reaction for Synaptophysin

Discussion

The present study was designed to determine the spectrum of childhood CNS tumors, their site, grade and morphological pattern. In many of the cases tumor like lesions cannot be differentiated preoperatively by clinical and radiological evaluation. We excluded these cases from our study. There have a paucity of publications regarding CNS lesions in Bangladesh.

Slight male predominance is found in this study (1.4:1). Other study of Asian region also found a high male to female ratio.[2,4, 10]

Present study revealed most cases in 10 to 15 years age group with a mean age of 10.30±5.48 years which is higher than other studies. The variation may be due to difference in sample size and selection of cases. This study defines pediatric age group up to 18 years of age whereas most of the study includes 14 or 15 years of age.[2,3,4] In this study most of the tumors were supratentorial (43.5%) and only (15.6%) were infratentorial. But other study showed that infratentorial tumors are most common in childhood.[11] As it is a hospital based study and NINS & H is a referral and research oriented hospital there are some selection bias. Some national and international workshop occurs in NINS&H regarding newer technological approach addressing tumor of some special site. This may be the cause of high sellar lesion in this study. However Pollack, 1999 found higher supratentorial tumor then infratentorial. Among the sellar lesion Craniopharyngioma was commonest.

Pattern of primary brain tumor in children differs significantly from adult. In this study tumors are further subdivided according to WHO grading system into 4 grades. However there are some tumors in which cases grade cannot be determined as Pituitary adenoma. We found that grade I tumor is more common in this age group (52.2%) followed by grade IV (19.4%). Among the grade I tumor Pilocytic astrocytoma (33, 13.8%) is the commonest tumor having better prognosis followed by Craniopharyngioma (19, 7.9%). In case of grade-II tumors, Ependymoma is (17, 7.1%) common in childhood. Medulloblastoma have a high frequency (13, 5.4%) followed by Central PNET (11, 4.6%) among the grade IV tumors. Jahan et al.[4] also found Medulloblastoma as the commonest childhood CNS tumor followed by Ependymoma in Bangladesh. That study was done with a small sample size in comparison to the present study. On the other hand other publications noted Astrocytoma as the commonest childhood CNS tumor.[10,12,13]

Conclusion

The study reflects supratentorial region as the commonest site and Pilocytic astrocytoma as the commonest pediatric CNS tumor. Craniophayngioma, Ependymoma, Medulloblastoma, PNET are next in frequency. The current study is a single institutional study. A population based study including a larger sample size and long study period is required to determine the tumor burden and histopathological pattern of childhood CNS tumor in Bangladesh.

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