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PAEDIATRIC NEURAL TUMOURS: STUDY AT A TERTIARY CARE CENTER IN WESTERN MAHARASHTRA

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ABSTRACT

Background: The rise in paediatric brain tumours has become an important cause of cancer related deaths in children, accounting for 20% of all childhood cancers under the age of 14 years.

Objective: To study spectrum of paediatric neural tumours, their prevalence and histomorphological features in detail and corelate them with age and sex of the patient.

Materials and methods: Data regarding age, gender, and histopathology of children (0-14 years) with neural tumours operated over a period of 2 years (June 2019 to June 2022) were collected retrospectively from the archives of Department of pathology of a tertiary care centre and were analysed and graded according to WHO grading of CNS tumours fifth edition.

Results: A total of 31 Paediatric neural tumours were studied. They were more common in males as compared to females with male to female ration of 1.2:1. Frequency of tumours was higher in children of age group 6-14 years. Astrocytomas and Schwannomas were the most common histological types followed by Medulloblastoma. Less common entities included Ependymomas, Meningomyelocele, Meningiomas and neurofibroma.

Conclusion: There is a rising incidence of neural tumours among children especially in the 5-14 years age group. Astrocytomas and Schwannomas were the most encountered histological types in our study. It is important to arrive at a confirmative diagnosis on the basis of histopathology for an effective and early management and better prognosis of the disease.

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Keywords: Childhood, astrocytoma, medulloblastoma, Schwannoma

INTRODUCTION

Childhood mortality in a developing country like India is largely due to infections and malnutrition and less commonly due to malignancies [1]. However, rise in paediatric brain tumours has become an important cause of cancer related deaths in children [2]. They account for 20% of all childhood cancers under the age of 14 years [3]. The incidence of paediatric brain tumours ranges from 0% to 2.11% according to Indian council of Medical Research, National Cancer Registry Data [4].

Unlike adults, childhood CNS tumours differ significantly in terms of their site of origin, presentation, tendency to disseminate early, histological features and biological behaviour [3].

In children, brain tumours are located in the infratentorial region. Commonly found tumours are Medulloblastoma, Ependymoma, low-grade astrocytoma and brain stem glioma [1]. Whereas, in adults gliomas, meningiomas and metastases from extracranial malignancies are common CNS tumours [2].

Since, these tumours are rare, their diagnosis is challenging and are often misdiagnosed. Suggested treatment for children is extensive tumour resection and chemotherapy. Prognosis is better in children as compared to adults and depends on type of tumour, location, duration, Grade (I-IV), speed of growth and infiltration into normal brain tissue. However, these available options can damage the developing brain leading to moderate to severe neurocognitive, psychological, and endocrine dysfunction [1].

We conducted this study to characterize the types of primary neural tumours and to know their histopathological features as appropriate diagnosis at proper time can lead to a better management and favourable prognosis in the children.

Hence, the objective of this study was to study spectrum of paediatric neural tumours, their prevalence and histomorphological features in detail and corelate them with age and sex of the patient.

MATERIALS AND METHODS

Data regarding age, gender, and histopathology of 31 patients with neural tumours (0-14 years) operated over a period of 2 years (June 2019 to June 2022) were collected retrospectively from the archives of Department of pathology of a tertiary care centre. The slides were stained with routine H and E stain and IHC was done for confirmation of diagnosis wherever necessary. The H and E slides were examined and analysed and were graded according to WHO grading of CNS tumours fifth edition. The results were analysed, tabulated and incidence of the various histopathological patterns were interpreted.

RESULTS

A total of 31 children diagnosed with neural tumours were included in the study. Among them, 17 (54.8%) were males and 14 (45.1%) were females with Male:Female ratio of 1.2:1. Their ages varied from 0 to 14 years. Among them 4 cases belonged to 0-2 years age group, 8 cases were among the >2-5 years age group and 19 cases among >5-14 years age group.

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Table-1 show histopathological distribution by age group at the occurrence.

AGE GROUP (0-14 YEARS)	NO. OF CASES	MOST COMMON TUMOURS
0-2 years	4	Astrocytoma, Medulloblastoma, Schwannoma, Myelomeningocele
3-5 years	8	Astrocytoma, Medulloblastoma, Ependymoma, Meningioma, Craniopharyngeoma
6-14 years	19	Astrocytoma, Medulloblastoma, Ependymoma, Schwannoma, Neurofibroma, Meningioma, Craniopharyngeoma

Table 1- Age wise distribution of tumours

The most common histological entities encountered were Astrocytomas accounting for 32.2% of all neural tumours, followed by Schwannoma (19.3%) and Medulloblastomas (9.6%). Less common entities include Ependymomas, Meningomyelocele and Meningiomas with an equal distribution (6.4%). One case of Neurofibroma (3.2%) was also reported. Table-2 shows various neural tumours arranged in descending percentage of their occurrence.

TUMOUR	FREQUENCY
Astrocytoma	10 (32.2%)
Schwannoma	6 (19.3%)
Medulloblastoma	3 (9.6%)
Ependymoma	2(6.4%)
Meningomyelocele	2 (6.4%)
Craniopharyngioma	2 (6.4%)
Meningioma	2 (6.4%)
Neurofibroma	1 (3.2%)

Table 2- Frequency of various tumours in the study.

Astrocytomas (WHO grade I tumors) were well-circumscribed and on histopathology they showed alternating densely packed fibrillary and loosely packed areas (biphasic). Rosenthal fibers were commonly seen in these dense areas. Eosinophilic granular bodies and hyaline droplets which are important diagnostic features were also seen. Eosinophilic granular bodies and hyaline droplets were noted at few foci. (Figure: 1a, 1b) In one case, there was a discrepancy in the final diagnosis. Hence, IHC marker GFAP was done which showed cytoplasmic positivity.

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Schwannomas were mostly well circumscribed neoplasms, composed of benign spindle shaped cells arranged in fascicles, exhibiting hypo and hypercellular areas. Verrucae bodies were occasionally seen. (Figure: 1c, 1d)

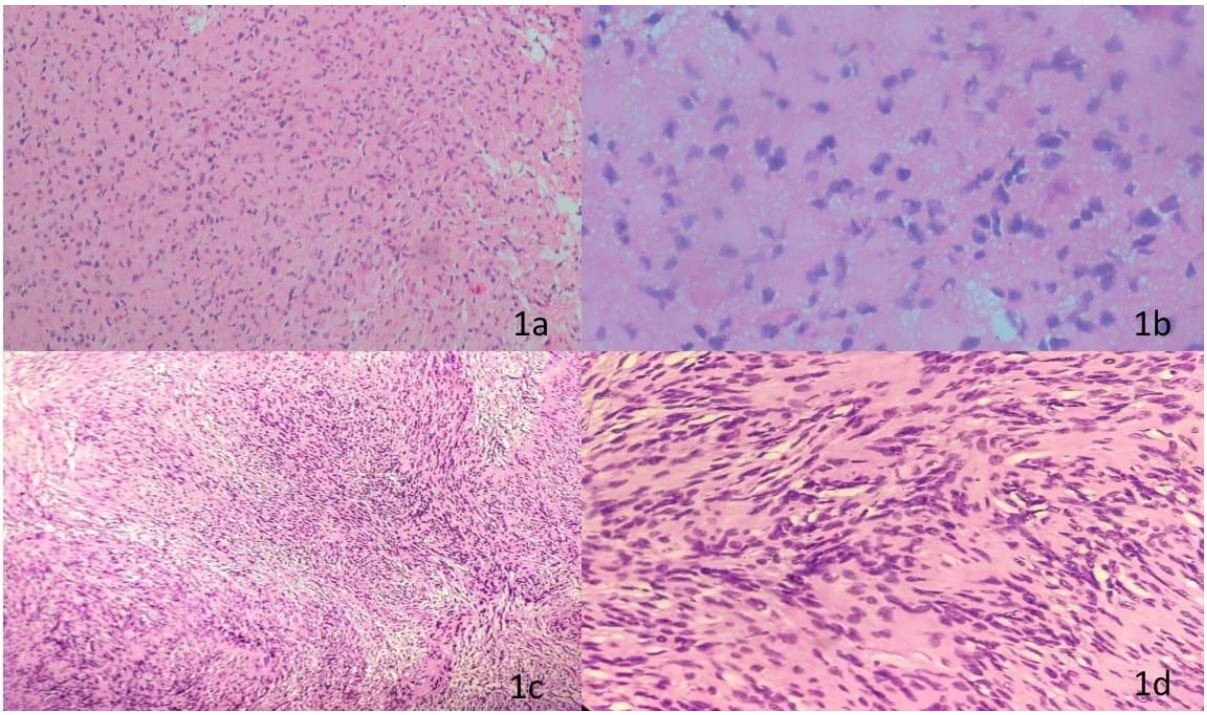

Figure 1- Different histological variants of paediatric neural tumours. Figure-1a: Astrocytoma. (H and E, 40X) Figure-1b: Astrocytoma-Diffusely infiltrating tumour cells with oval to elongated astrocytic nuclei and varying appearance of cytoplasmic and fibrillar glial process. (H and E, 400X) Figuire-1c: Schwannoma (H and E, 40X). Figure-1d: Schwannoma-Spindle shaped cells arranged in palisading pattern with areas of comparatively less cellularity (H and E, 400X).

Medulloblastomas showed syncytial arrangement of densely packed undifferentiated cells. Homer Wright rosettes were seen occasionally. (Figure: 2a, 2b)

Two cases of Ependymomas were seen (WHO grade II tumour), which showed monomorphic round to oval cells with speckled chromatin. Occasional perivascular pseudorosettes were seen. (Figure: 2c)

Craniopharyngioma showed whorls and trabeculae of squamous epithelium with nodules of plump, anucleate squamous cells and wet keratin in two cases. (Figure:2d)

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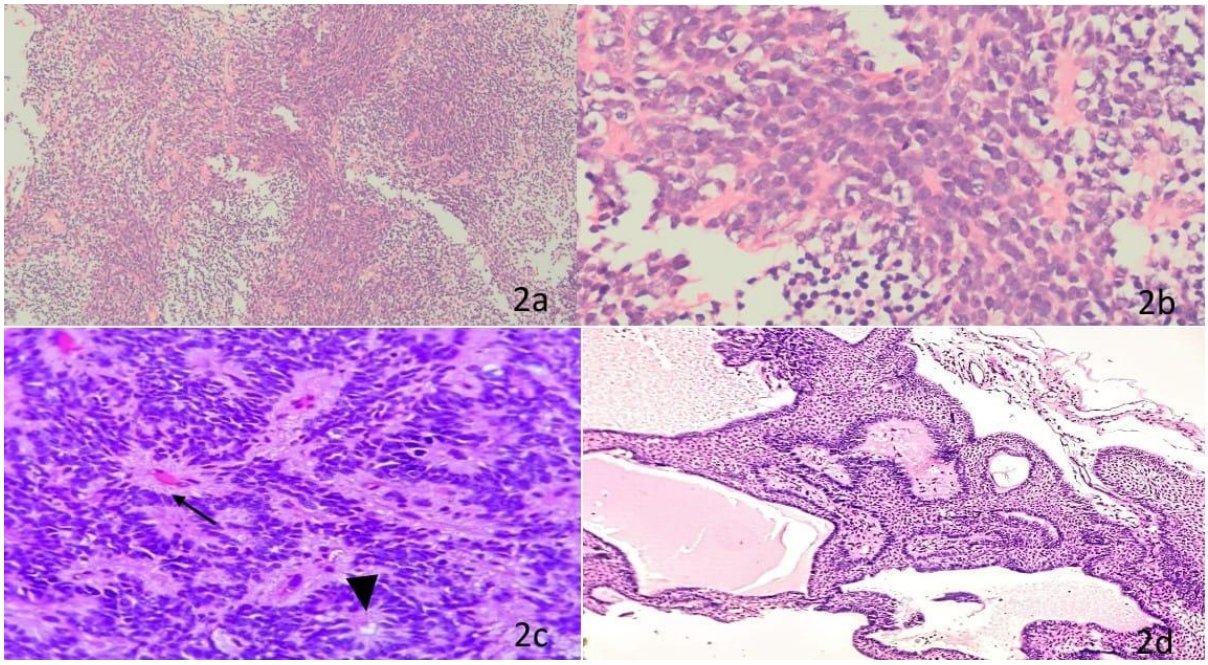

Figure 2- Different histological variants of paediatric neural tumours. Figure-2a: Medulloblastoma- Tumour cells show a syncytial arrangement of densely packed cells (H and E, 40X). Figure-2b: Medulloblastoma- Tumour cells forming rosettes (H and E, 400X) Figure-2c: Ependymoma- monomorphic round-oval cells with speckled chromatin and true rosettes (Arrowhead) and perivascular pseudorosette (Arrow) (H and E, 400X) Figure-2d: Craniopharyngioma- cords and trabeculae of squamous epithelium lined by palisading columnar epithelium, nodules of plump anucleate squamous cells and wet keratin. (H & E, 100X)

DISCUSSION

In a developing country like India children constitute a large part of the population [1]. Significant advances have been made in the management of paediatric malignancies. Yet, Paediatric brain tumours pose a tough challenge for histopathologists worldwide.

In the present study, we analysed data regarding the demographics and histological profile of 31 paediatric patients operated for neural tumours at one of the major tertiary care hospitals.

Age-wise and Gender-wise Distribution: A study conducted by Das U et al [5] in year 2014, maximum number of cases reported were in the age group >5-14 years with a Male predominance and M:F ratio of 1.58:1. These findings corelated with our study, which showed similar findings. In the present study out of 31 cases, 54.8% (17) were males and 45.1% (14) were females with maximum number of cases being in the age group 5-14 years.

Govindan A et al [6] in 2018 procured data from neurosurgery and pathology department and analysed 5-year data of paediatric brain tumours operated in North Kerala from 2009 to 2013. The mean age was 8.3 years. There were 71 histologically proven cases of brain tumours, 47.9% were males and 52.1% were females. High grade tumours were seen more in infants and children <10 years and low-grade tumours were more common in children above the age of 11 years.

Mehta et al [7] performed a retrospective study of patients presenting with PBTs between January 1, 2006, to December 31, 2015, in Gujarat. There were 242 patients, out of which 230 were among the 0-14 years age group. Males accounted for 149 (64.8%) cases while

females were 81 (35.2%). A male predominance was observed in case of ependymal tumours, meningiomas and medulloblastoma. Out of the total 242 patients of PBTs, 189 cases were from 5 to 14 years age group, and almost equal number of cases were in 5-9- and 10-14-years age group.

Histopathological Distribution: In the present study Astrocytoma was the single most common histological entity, followed by Schwannoma and Medulloblastoma. Similar findings were reported by Pinho et al [3] in year 2009 in which 741 cases were studied, out of which Astrocytomas were the most seen in all age groups. Medulloblastomas were the second most common tumour seen in 13.6% cases and peaked between 5-10 years of age. Craniopharyngioma was seen in 10.5% cases with mean age of >10 years and Ependymoma was the least common, 6.8%, predominant in first 2 years of life.

Margam et al [8] in the year 2016 conducted a study over a 15-year period. In which 239 cases were studied among which males were predominantly affected. However, Medulloblastoma was the most common in their study, seen in 16.3% cases followed by Astrocytomas.

Kumar et al [9] conducted a study in GB Pant and TMH institute in which a higher incidence of Medulloblastomas amongst Indian children was reported.

Also, Shiraz N et al [1] conducted a study for a period of 10 years in which 67 cases of CNS tumours were reported out of 1194 non haematopoietic paediatric malignancy. of these 67 cases, 54 cases were brain tumours and 13 were spinal cord tumours. Medulloblastoma (20.3%) was the most common tumour followed by Pilocytic astrocytoma (16.6%) and Glioblastoma multiforme (9.5%). Overall, the highest incidence was in 5-9 years age group (46.2%)

CONCLUSION

There is a rising incidence of neural tumours among children especially in the 5-14 years age group. Our study showed Astrocytomas and Schwannomas to be the two most encountered histological types. It is important to arrive at a confirmative diagnosis on the basis of histopathology for an effective and early management and better prognosis of the disease.

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