OPEN ACCESS
Saudi Journal of Pathology and Microbiology
Abbreviated Key Title: Saudi J Pathol Microbiol
ISSN 2518-3362 (Print) |ISSN 2518-3370 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

A Cross Sectional Study of Clinical and Histopathological Spectrum of Pediatric Brain Tumours

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DOI: 10.36348/sjpm.2022.v07i04.006 | **Received:** 21.03.2022 | **Accepted:** 25.04.2022 | **Published:** 30.04.2022

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Abstract

Introduction: Brain tumors are the most common tumor of the childhood and the second most common malignancies after haematological malignancies. Childhood central nervous system (CNS) tumors differ significantly from adult brain tumors in reference to their sites of origin, clinical presentation, tendency to disseminate early, histological features and their biological behaviour. ***Aims and Objective:*** Analyse the Clinical and histopathological spectrum of brain tumors, in pediatric patients ≤18 year of age. ***Materials and Method:*** This was a cross sectional study conducted at the department of pathology, SMS medical college, Jaipur from January 2020 to October 2021. This is a laboratory based descriptive type of observational study and data of brain tumors in children equal or less than 18 year of age procured and their clinico-histopathological spectrum were analyszed. ***Result:*** In our study, Out of 116 patients 51.8 % were male and 48.2 % were female. Mean age for the male cases were 10.11 and for female cases were 9.78. we observed intracranial pediatric tumors 67 cases (57.7%) were located in infratentorial region and 49 cases (43.3%) were located in supratentorial region and incidence for intracranial tumor was 39(33.62%) cases of astrocytomas followed by 25 (21.55%)cases of medulloblastoma, 20 (17.24%)cases of ependymoma, 13 (11.20%) cases of craniopharyngioma, 5 (4.31%) cases of pituitary adenoma, 4 (3.44%) cases of meningioma, 3 (2.58%) cases of embryonal and choroid plexus tumor, 2 (1.72%) cases of ganglioglioma and 1 (0.86%) case of Schwannoma and PNET. In this article, Based on tumor location, the symptoms of CNS tumors on the supratentorial region were headache (22 cases, 44.8%), impaired vision (10 cases, 20.4%), seizures (6 cases, 12.2%), vomiting (4 cases, 8.1%). Symptoms of CNS tumors on the infratentorial region were headache (48 cases, 71.6%), vomiting (5 cases, 7.4%), impaired vision (4 cases, 5.9%), seizures (3 cases, 4.4%). ***Conclusion:*** Infratentorial cases, maximum number of cases were medulloblastomas and supratentorial cases, maximum number of cases were astrocytic tumours. Overall astrocytic tumours in all senses constituted the most common group of CNS tumours. Within astrocytoma, low grade astrocytoma (grade I & II) was most common CNS paediatric tumour.

Keywords: Astocytic tumour, Medulloblastoma, cerebellum, supratentorial tumors, World Health Organization.

INTRODUCTION

Brain tumour are the most common tumour of the childhood and the second most common malignancies after haematological malignancies accounting for approximately 21% of all childhood malignancies in children between 0 and 14 year of age [1]. The incidence of pediatric brain tumors varies among different countries. It ranges from 1.15 to 5.14 cases per 100,000 children, with the highest rates reported in the United States. Childhood central nervous system (CNS) tumors differ significantly from adult brain tumors in reference to their sites of origin, clinical presentation, tendency to disseminate early, histological features and their biological behaviour [2].

The exact histological diagnosis and location of CNS tumour is essential not only to predict the prognosis of the patients but also influence the treatment modality while investigating the risk factors. Previously brain tumors were classified mainly on basis of histogenesis is based on the cells of origin and their supposed levels of differentiation. But due to overlapping of entities and newer lesions there was a need for internationally standardized terminology and classification and hence newer classification were based on both histopathological and molecular features [3].

The 2016 WHO classification has included molecular information into diagnosis and classification as must.

The present study attempts to determine the clinical and histopathological features, and also to compare the results of this study were those of previous studies, to assist physicians determine the best treatment options for children with brain tumors, in turn increasing their age expectancy rate.

MATERIAL AND METHOD

This is a Laboratory based descriptive type of observational study wherein data on intracranial brain tumors in the pediatric age group (≤18 years) were collected and histological slides reviewed from January 2020 to December 2021. Immunohistochemistry was used where necessary and the cases categorized as per the 2016 WHO classification.

Inclusion Criteria

All Cases of pediatric brain tumors submitted in department of pathology during study period and those who give informed written consent.

Exclusion Criteria

Non neoplastic lesions of CNS, Cases with incomplete history and radiological details, Poorly preserve biopsy, >18 years age.

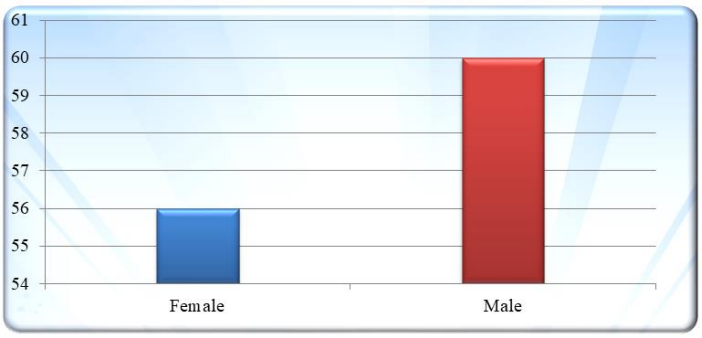
RESULTS

Distribution of the cases according to gender

In this study, Out of 116 patients 51.8% were male and 48.2% were female (Table 1). The male to female ratio was 1.07:1. Mean age for the male cases were 10.11 and for female cases were 9.78 and Mean age for the total cases male and female were 9.95 (Table 2).

Table 1: Distribution of the cases according to gender

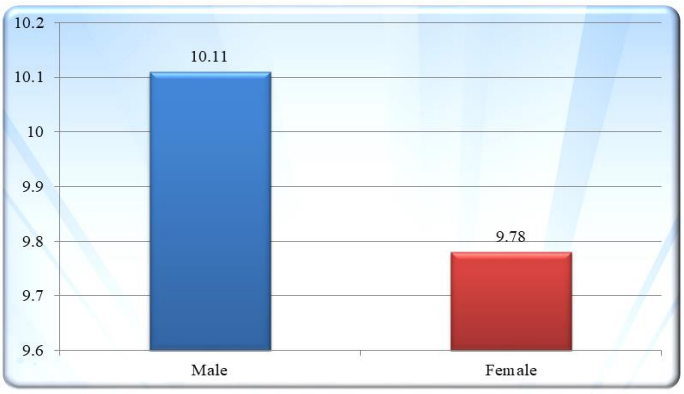
Gender	Number	Percentage %
Female	56	48.2
Male	60	51.8
Total	116	100



Graph 1: Distribution of cases according to gender

Table 2: Distribution of Mean Age of study cases

Age (In Years)	Male	Female	Total
Mean	10.11	9.78	9.95
SD	4.67	5.13	4.90



Graph 2: Distribution of Mean Age of study cases

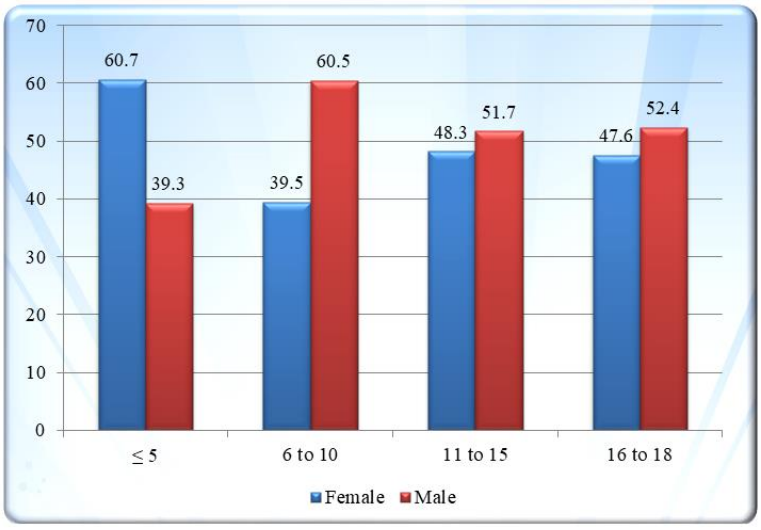
Distribution of the cases according to age group and Gender

In our study most of cases 32.8% were 06 to 10 years of age, followed by 11 to 15 years of age 25% and ≤5 year of age were 24.1% and the least 18.1% was 16 to 18 years of age. No significant association was observed between the age group and gender (p value-0.404). Although among females, most common age groups ≤5 year of age (60.7%), and in males most common age groups affected was 6 to 10 years of age (60.5%) (Table 3, Graph 3).

Table 3: Distribution of the cases according to age group and Gender

Age group	Female (%)	Male (%)	Total (%)
≤ 5	17(60.7)	11(39.3)	28(24.1)
6 to 10	15(39.5)	23(60.5)	38(32.8)
11 to 15	14(48.3)	15(51.7)	29(25.0)
16 to 18	10(47.6)	11(52.4)	21(18.1)
Total	56(48.3)	60(51.7)	116(100)

Chi-square- 2.917 with 3 degree of freedom; P value-0.404



Graph 3: Distribution of cases according to age group and gender

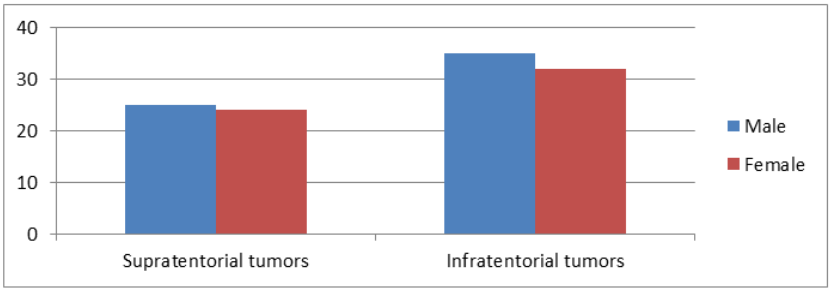
Distribution of cases according to Localization of CNS tumour at various sites

In this study we observed location of pediatric CNS tumors of 116 cases- In intracranial pediatric tumors 67 cases (57.7%) were located in infratentorial region and 49 cases (43.3%) were located in supratentorial region (Table 4, Graph 4).

Table 4: Localization of CNS tumour at various sites

Localization	Cases	Male	Female	Ratio
Supratentorial Tumors	49	25	24	1.04:1
Infratentorial Tumors	67	35	32	1.09:1
Total	116	60	56	1.07:1

Chi-square- 1.419 with 1 degree of freedom; P value- 0.233



Graph 4: Localization of paediatric CNS tumors

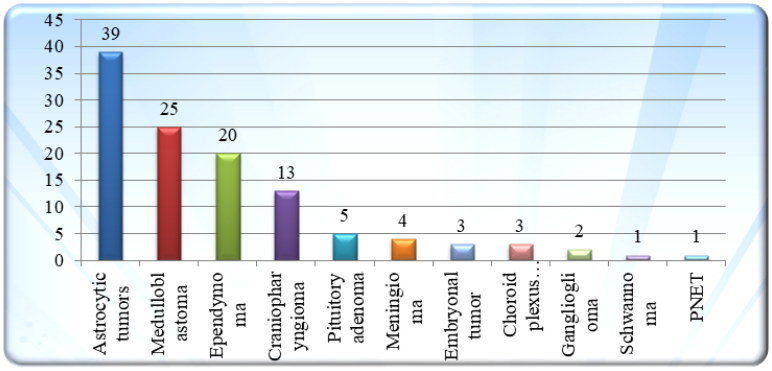
Incidence of individual pediatric CNS tumors

Out of 116 cases of pediatric tumor in this study, incidence for intracranial tumor was 39(33.62%) cases of astrocytomas followed by 25 (21.55%) cases of medulloblastoma, 20 (17.24%)cases of ependymoma, 13 (11.20%) cases of craniopharyngioma, 5 (4.31%) cases of pituitary adenoma, 4 (3.44%) cases of meningioma, 3 (2.58%) cases of embryonal and choroid plexus tumor, 2 (1.72%) cases of ganglioglioma and 1 (0.86%) case of Schwannoma and PNET (Table 5, Graph 5).

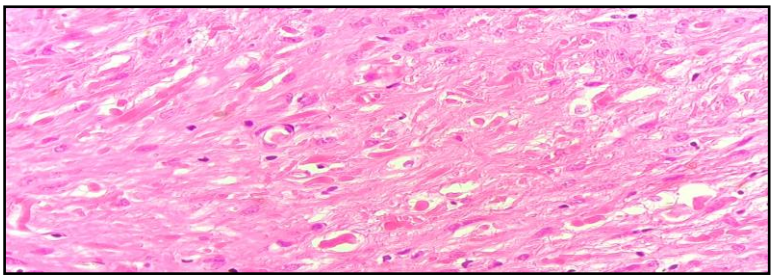
Table 5: Incidence of individual pediatric CNS tumors

S. No	Tumors	No. of cases	Percentage (%)	Male	Female
1	Astrocytic tumor	39	33.62	19	20
2	Medullablastoma	25	21.55	15	10
3	Ependymoma	20	17.24	09	11
4	Craniopharyngioma	13	11.20	07	06
5	Pituitory adenoma	05	4.31	01	04
6	Meningioma	04	3.44	03	01
7	Other Embryonal tumors	03	2.58	01	02
8	Choroid plexus tumor	03	2.58	01	02
9	Ganglioglioma	02	1.72	02	00
10	Schwannoma	01	0.86	01	00
11	Ewing sarcoma/PNET	01	0.86	01	00

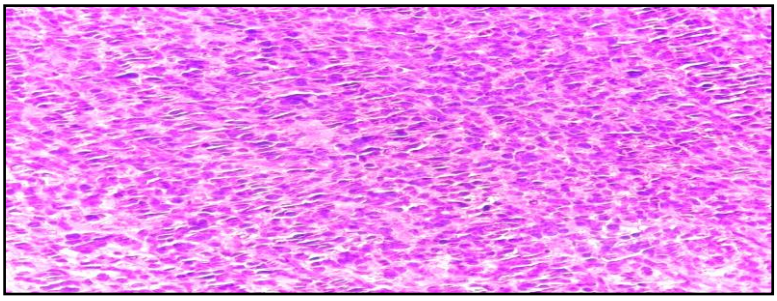
Chi-square- 3.104, p value- 0.540



Graph 5: Incidence of individual pediatric CNS tumors



Photograph 1: Bipolar cells, Rosenthal fibres and eosinophilic granular bodies in Pilocytic astrocytoma, H&E (40 x)



Photograph 2: Classic Medulloblastoma showing round tumour cells & rosettes, H & E (40x)

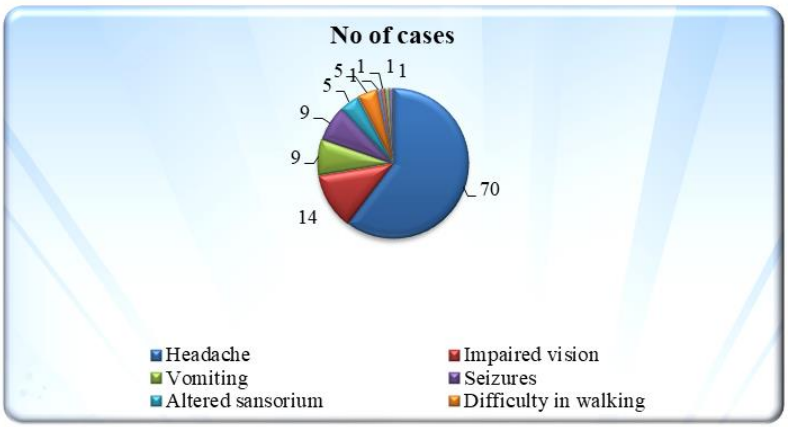
Distribution of cases according to clinical characteristics

In this study, the most frequent paediatric brain tumor symptoms were headache (70 cases, 60.34%), Impaired vision (14 cases, 12.06%), vomiting (09 cases, 7.75%), seizures (09 cases, 7.75%), altered sensorium (05 cases, 5.17%), Difficulty in walking (06 cases, 5.17%), hemiparesis (01 cases, 0.88%), macrocephaly (01 cases, 0.88%), deafness (01 cases, 0.88%) (Table 6, Graph 6).

Table 6: Distribution of cases according to clinical characteristics

Clinical complaints*	Number of cases	Percentage (%)
Headache	70	60.34
Impaired vision	14	12.06
Vomiting	09	7.75
Seizures	09	7.75
Altered sensorium	05	5.17
Difficulty in walking	05	5.17
Hemiparesis	01	0.88
Macrocephaly	01	0.88
Deafness	01	0.88
Neck pain	01	0.88

*One patient may have more than one symptom



Graph 6: Distribution of cases according to clinical characteristics

DISCUSSION

Demography

The present study was conducted in department of pathology, SMS Medical college and Hospital, Jaipur in collaboration with department of neurosurgery, SMS Hospital, Jaipur. 116 consecutive cases of pediatric central nervous system tumors were sent for histopathological diagnosis. They were evaluated in relation to frequency of different tumors with respect to age, gender, anatomic location, clinical and radiological features. Of the sample of 116 study cases attending neurosurgery department, proportion of male was found greater (51.8%) than female (48.2%) in this study. The male to female ratio was 1.07:1. In congruence to our study Asirvatham JR *et al*., (2011), Margam S *et al*., (2016), Suresh SG *et al*., (2017) and Siregar MH *et al*., (2018), also have found similar observation on male and female distribution.[2] However Govindan A *et al*., (2018) showed female predominance in their study. In this study mean age of the study cases was 9.95 years. Similarly Asirvatham JR *et al*., (2011), Shah HC *et al*., (2015) and Gupta A *et al*., (2019) also have found mean age of paediatric central nervous system tumour cases ranged from 9-11 years. In present study mean age of male cases were 10.11 years and 9.78 years for female. In this study most of cases 32.8% were 6-10 years of age. However Chilukuri S *et al*., (2019) has reported most of cases 64.4% were 11-18 years, which may be because the sample size of this study was less than compare to our study sample size. In our study, there are no significant association was observed between the age group and gender.

Location of Tumours

In this study, supratentorial pediatric central nervous system tumors were male preponderance 51.02%, whereas females were 48.97%. Similarly Chilukuri S *et al*., (2019) shows a male preponderance in supratentorial region in their study. In this study infratentorial tumours (57.7%) were more common than supratentorial tumours (43.3%). Similar findings were published by Siregar MH *et al*., (2018), Gupta A *et al*., (2019). Other studies of Asirvatham JR *et al*., (2011), Margam S *et al*., (2016), Suresh SG *et al*., (2017) and Govindan A *et al*., (2018) shows a preponderance of

supratentorial tumours. In present study, no significant difference was observed in distribution of cases according to localization with gender.

Tumours incidence

In present study, incidence for intracranial tumour was 39(33.62%) cases of astrocytic tumours followed by 25(21.55%) cases of medulloblastoma, 20(17.24%) cases of ependymoma. This is close to the result from study by Shah SH *et al*., (1999), Jain A *et al*., (2011), Asirvatham JR *et al*., (2011), Margam S *et al*., (2016), Gupta A *et al*., (2019) and Deshpande NS *et al*., (2021) who reported the astrocytic tumours were most common [13]. However Suresh SG *et al*., (2017) and Govindan A *et al*., (2018) who reported the medulloblastoma were most common paediatric central nervous system tumour [15].

Clinical Characterstics

In the present study, Among the all symptoms, headache is the most frequent symptoms of paediatric brain tumour (60.34%). Similar to our findings, a study by Siregar MH *et al*., (2018) and Wilne SH *et al*., (2006) also reported headache is the most frequent symptom [12]. However Suresh SG *et al*., (2017) who reported vomiting is the most frequent clinical presentation [14].

CONCLUSION

The study aimed to assess the clinical and histopathological spectrum of paediatric brain tumour among the cases undergoing diagnosis and treatment at neurosurgery department of SMS medical college, Jaipur. Observed proportion of male was greater than female in this study. Male to female ratio was 1.07:1. In male highest proportion of cases was observed from 6 to 10 years of age group. However, in female highest proportion of cases was observed in <5 years of age group. Mean age for the male cases were 10.11 and for female cases were 9.78 years. Mean age for the total cases male and female were 9.95 years. In this study we found that 57.7% paediatric CNS tumours were located in infratentorial region and 43.3% were located in supratentorial region. Out of 57.7% infratentorial cases, maximum number of cases were medulloblastomas. Out of 43.3% supratentorial cases, maximum number of cases were astrocytic tumours. Out of 116 cases, the most frequent paediatric brain tumour symptoms were headache (70 cases), impaired vision (14 cases), vomiting (9 cases), seizures (9 cases), altered sensorium (5 cases), difficulty in walking (5 cases) and hemiparesis, macrocephaly, deafness (each 1 case). Based on the tumour location the most common symptoms of CNS tumours of supratentorial region and infratentorial region were headache, vomiting, impaired vision, seizure.

Financial support and sponsorship: Nil.

Conflicts of interest: There are no conflicts of interest.

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