



## RESEARCH ARTICLE

## PEDIATRIC BRAIN TUMOR- SINGLE CENTER STUDY

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**ABSTRACT:**

**Objective:** Describe the frequency of brain tumor their distribution according to age, sex and their histological distribution in pediatric patients. **Material and Methods** – All the pediatric patients who attended oncology department, IGIMS Patna from year June 1999 to June 2014 were analyzed according to their age, sex and their histological distribution. **Result:** The most common primary pediatric brain tumors were Astrocytomas (41.8%), Medulloblastomas (26.7%) and primitive neuro ectodermal tumor were 7.8%, and most common age group was 4-7 year in our study. **Conclusion:** Our study shows the spectrum of pediatric brain tumor in Regional Cancer centre of Bihar state.

**Key words:** Astrocytoma, Medulloblastomas pediatric brain tumor.

**INTRODUCTION**

Pediatric Brain tumors are the second most common childhood tumor<sup>1</sup>. It remains the leading cause of cancer related death in children<sup>2</sup>. Intracranial tumors in children once thought to be rare have been discovered more frequently since the introduction of new imaging techniques<sup>3</sup>. Intra cranial childhood tumors affect 33 per 100,000 children annually<sup>4</sup> and comprise about 20-30% of all pediatric cancers<sup>5</sup>. Approximately 1100 new cases are diagnosed in United States each year<sup>6</sup>.

A 20 year survey of pediatric brain tumor in patients below 20 years of age was incidence reported in 31 per million in boy and 25.9 per million in girls respectively<sup>7</sup>. The overall male ratio was 1.1 to 1.6<sup>8</sup>.

The overall pattern of brain tumors includes a peak incidence below five years of age which increases gradually up to the age of 20 years. The age pattern varies accordingly to tumor type<sup>9</sup>. Peak incidence occurs in below 5 years of age in pediatric brain tumor.

The peak age for ependymoma and Medulloblastoma is in the 0-4 year and for Pilocytic Astrocytoma is in the 5-9 year age group (central brain tumor registry of United States CBTRUS data for 1990-1993)<sup>10</sup>.

These tumors are greatest cause of childhood mortality in this age group in many parts of world<sup>11</sup>. In these days due to better diagnostic technique and improvement in therapeutic modalities longer survival is reported due to early detection.



About 2,00,000 new cases of childhood cancer has been diagnosed annually worldwide in which 80% cases are from developing countries.<sup>12</sup>

The central brain tumor registry of United States reports that seven percent of the cases were less than twenty years in 2004-2008; 43% cases were male<sup>13</sup>.

Occurrence of brain and CNS tumors in young adults were significantly rising between 1975 and 1995<sup>14</sup>.

Objectives of this current retrospective study were to describe the frequency of brain tumor their distribution according to their age, sex and their histological differences in pediatric age group.

#### MATERIAL AND METHOD :

This is a retrospective single center study conducted at radiation oncology department IGIMS, Patna. Data were collected and analyzed with all the patients of pediatric brain tumor registered in our department. The time period included from 1999 to 2014. Only primary brain tumor from age groups 0 to 15 years were included metastatic brain tumors and other vascular malformation has been excluded from this study. All of the cases were histological proven and categorized according to WHO classification. A total of 153 patients of pediatric age group were collected and analyzed.

#### RESULTS :

Pediatric brain tumor accuated about 17.1% of total primary brain tumors. We found 153 cases of pediatric brain tumor in this study. In which 68.6% patients were male and 31.3% patients were females. Male: Female ratio was 2.1:1 in our study.

**Table No. 1:** Morphological Distribution of pediatric brain tumors comparison current study and other published studies.

Reference	Period of study	Total No.	Astrocytomas	Medulloblastoma	Ependymoma	Mixed Glioma	Oligodendroglioma	Rare bills Astrocytoma
Present Study	2000-14	153	41.8	26.7	7	7	2	-
Farewell et al (1997)	1935-73	467	28	25	9	-	-	-
Humphery 1982	1950-75	451	12.64	24.19	8	-	-	24.6
Zamanb 1990	1988-89	20	-	40	10	-	-	40
Moeso et al 1992	1967-86	293	27.3	19.11	-	27.3	-	-
Gurney et al 1993	1974-89	2205	60.9	23.9	8	-	-	-
Nazir 1995	1991-95	20	65	-	5	-	-	-

Most common age group in our study was 4-7 years which was 41.8%, 25.4% patients were of age group of 8-11 years and 18.9%, 13.7% were of 12-15 years of age, 0-3 years respectively.

**Table No. 2** Age Group

Age group	Total no. of patients	Male (105)	Female (48)
0-3 year	21 (13.7%)	15 (14.2%)	6 (12.5%)
4-7 year	64 (41.8%)	42 (40%)	22 (45.8%)
8-11 year	39 (25.4%)	28 (26.6%)	11 (22.9%)
12-15 year	29 (18.9%)	20 (19%)	9 (18.7%)
<b>Total</b>	<b>153</b>	<b>105</b>	<b>48</b>

Histological most common brain tumor was astrocytomas which were 41.8% followed by Medulloblastoma 26.7% and primitive neuro ectodermal tumor was 7.8% in this study.

**Table No. 3:** Distribution of pediatric brain tumor according to histology of 153 patients

Histologic type	Total no. of patients	Male	Female
Astrocytoma	64		
Pilocytic	43	29	14
Gemistocytic	3	3	0
Grade II	11	7	4
Anaplastic	5	3	1
GBM	3	2	1
Oligodendroglioma	4	4	0
Ependymoma	12	9	3
PNET	20	12	8
Medulloblastoma	41	28	13
Mixed glioma Oligoastrocytoma astroependiymo	12	8	4
<b>Total</b>	<b>153</b>	<b>105 (68.6%)</b>	<b>48 (31.3%)</b>

## DISCUSSION:

Etiology of majority of cases is unknown. Ionizing radiation, trauma, electromagnetic fields has proven etiological effect on brain tumor formation.<sup>15</sup>

Denver reported in 1979 in a study that children who lived near high electromagnetic field had higher risk of developing leukemia, brain tumor.<sup>16</sup>

There are many studies available which showed positive relationship between the incidence of primary brain tumor formation and pesticide consumption.<sup>17</sup>

In recent times an enhanced understanding of these biological differences between adult and pediatric cancer has led to investigations in distinct molecular and genetic pathways and therapeutic approaches for each tumor type. There are several reports available regarding the epidemiology of pediatric brain tumor in the Western literature.<sup>(18,19)</sup>

Their etiology may be multi factorial and both genetic and environmental factors are responsible.<sup>20</sup>

Some accepted risk factors are Ionizing radiation and hereditary disorders according to Ohgaki and Kleihues 2005.<sup>21</sup>



Some studies shows pre and prenatal exposure of obnoxious environment may be responsible for primary brain tumor but same times other studies shows unseen desire and results<sup>22, 23, 24, 25,26</sup>.

Frequency of pediatric malignancies was 12.1% of total pediatric malignancies, Rate was little higher in comparison to other studies conducted earlier<sup>27</sup> reported 8.2 in Bombay cancer registry<sup>28</sup> reported 9%. The difference in frequency may be due to some regional and environmental factors that are responsible for pediatric brain tumors. At this time incidence of pediatric brain tumors are increasing due to availability of radio imaging technique which are able to diagnose in early stage.

The histological distribution of pediatric brain tumor in our study, the most common tumor was Astrocytomas(41.8%), Medulloblastoma(26.7%). some studies available showed most common tumor was Astrocytomas in their study<sup>18</sup> reported 28% cases were Astrocytomas while medulloblastomas were 25% in their study a series of 488 pediatric brain tumors<sup>29</sup> showed 60.9% of cases of astrocytomas in their study. Moss et al 1992 reported 27.3% of astrocytomas, most common tumor in their study<sup>34</sup> also showed most common tumor was astrocytoma.

Some other studies showed most common tumor was medulloblastomas<sup>19</sup> 36% patients were of medulloblastomas. Zaman et al<sup>32</sup> 1990 reported most common incidence of medulloblastoma it was 40% of all pediatric brain tumors.

Incidence of other tumors was comparable with other studies conducted earlier as shown in table no1.

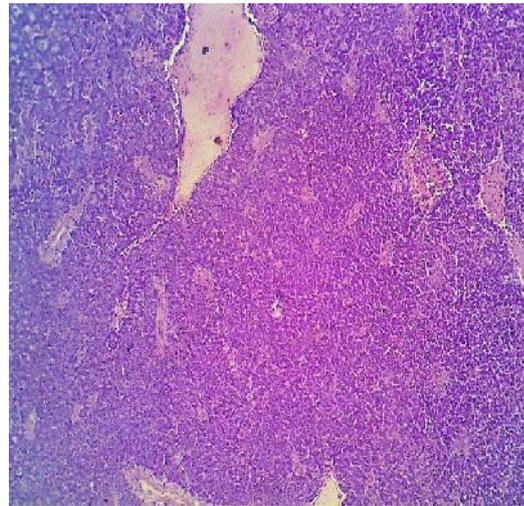
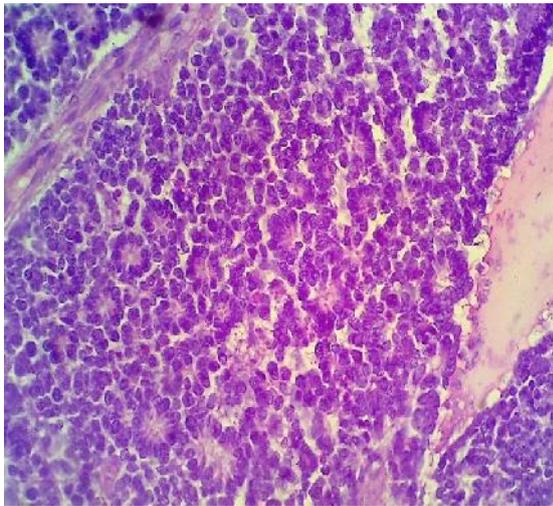
Most common age group in our study was 4-7 years which was supported by Gurney et al<sup>29</sup> 1995. They reported the increase incidence in 4-8 and 5 to 10 years of age for astrological astrocytoma.

Incidence of pediatric brain tumors was 17.1% of total of primary brain tumor. Which was very close to study conducted<sup>33</sup>. They reported 18.61% incidence of pediatric brain tumors in their study.

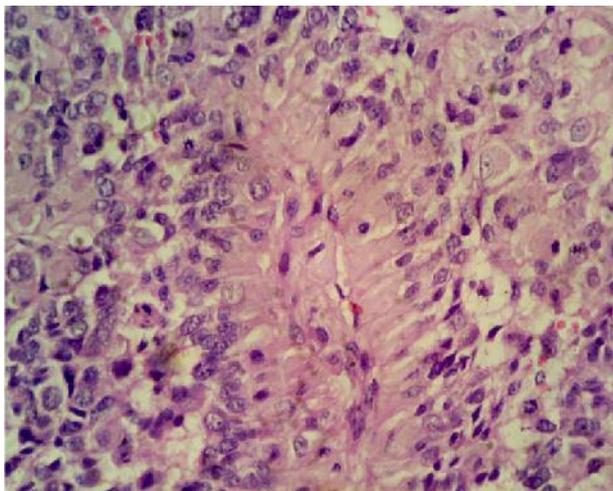
Pediatric brain tumors differ significantly from adult brain tumors in reference to origin clinical presentation, tendency to disseminates, histological features and their biological nature. In adult most common brain tumor types are brain metastasis, glial tumors and meningiomas while in children most common tumors are gliomas, oligodendroglioma primitive neuro ectodermal tumor, ependymoma choroid plexus tumor<sup>34</sup>.

The study done by Rickest and paulius<sup>31</sup> reported ependymoma were third most common pediatric brain tumor and craniopharngioma were on the fourth most common pediatric brain tumor. Same trend can be seen in other studies conducted in other countries like Germany<sup>35</sup>, Swedan<sup>36</sup>, morocco<sup>37</sup>.

Vast majority of data shows medulloblastoma as the predominantly pediatric tumor<sup>19, 38</sup>. A preponderance of medlloblastoma was also reported by parker at al<sup>19</sup> in 1990 with 36%, PNET 28%, cerebular astrocytoma. Mosso et al<sup>38</sup> in 1992 showed the result of childhood cancer registry of Torino(Italy) over a period of 20 years. In this study medulloblastomas were 19.11%, astocytoma 27.3%, epedynoma 4.78%.



Section shows sheets of cells having small round hyperchromatic nuclei with scanty cytoplasm. Tumor cells have tendency to form rosettes-- Meulloblastoma .



Anaplastic Ependymoma section shows cells having moderately pleomorphic hyperchromatic nuclei in fibrillary background. Tumor cells have tendency to form pseudorosettes

**CONCLUSION:**

Present study revealed the pathological distribution of pediatric brain tumors and provides spectrum of brain tumor in children in an institute of Bihar. We have analyzed our records according to their distribution with age, sex Male: Female ratio and histological classification. More multi centric studies are required to represent the exact burden of disease. Pediatric brain tumors are increasing due to incomplete registries of newly diagnosed cases and lack of local cancer registries exact burden of disease is under estimated. Public awareness about the symptoms and the severity of disease is required. Health facilities provided by government should be informed to public.



## REFERENCES:

1. Rosemberg S, Fujiwara D. Epidemiology of pediatric tumors of the nervous system according to the WHO 2000 classification: A report of 1,195 cases from a single institution, Childs Nerv Syst 2005;21:940-4.
2. Jemal A, Siegel R, Ward E, Murray T, Xu J, Smigal C, et al. Cancer statistics, 2006. CA Cancer J Clin 2006;56:106-30.
3. Birch JM, Hatley AL, Teare MD, et al (1990). The inter regional epidemiological study of childhood cancer (IRES CC) : case control study of children and central nervous system tumors. Br J. neurosurg 4,17-25.
4. Tomita T (1998) Neurosurgical perspectives in pediatric neuro oncology child's nervous system 14,94-6.
5. Rickert CH, Probst-cousin S, Gullota F (1997), Primary intracranial neoplasms of infancy and early childhood. Child's nervous system 13,507-13.
6. Preston-Martins S, Staples M, Farrigin Hetal (1993), primary tumors of the brain cranial.
7. Robinson L, L, Mertens A, Neglia JP(1991) : Epidemiology and etiology of childhood cancer in : clinical pediatric oncology.
8. Velema JP and Percy L L (1987) Age curves of central nervous system tumor incidence in adult's variation of shape by histologic type, J Natl cancer institute 79,623-9.
9. Kurland LT, Schoenberg BS, Annegers JF et al (1982). The incidence of primary intracranial NEOPLASM IN Rochester Minnesota 1935-1977, Ann New York Acad Sciences 318,6-16.
10. CBTRUS (1996) First annual report 1995. Central brain tumor registry of United States.
11. EL basmi A , AL Asfour A (2007) Kelwait cancer Registry Annual report. Ministry health kuwait
12. Barr R Riberio R Agarwal B masera G Hessenling P mayrath, pediatric oncology in countries with limited resources In: Pizzo PA Poplack DG, eds: principles and practice of pediatric oncology 5th ed, Philadelphia: Lippincott Williams and Wikins :2006p 1605-07.
13. Dolecek TA prop Jn, stroopNE, Kruckkoc primary brain and central nervous system tumors diagnosed in the united stated in 2005 2009, neuro oncal 2012:14,1-49
14. http linet MS reis LA, smith MA Tarone RE , Devesa ss cancer survelliance series: recent trent in child hood cancer incidence and mortality in United states. J natl cancer 1<sup>st</sup> 1999-91:1051-1058
15. Ron E, Modan B,Boice JD, Alfandary EStovall M, Chetrit A Katz L. Tumors of the brain and nervous system after radiotherapy in childhood. NEJM 1998;319(16):1033-9
16. Westheimer N, Looper E, Electrical wiring configuration and child cancer Am. J.Epidemol 1979(3)273-84
17. Davis JR, Brownson Rc, Garcia R,Bento BJ, Turner A et al Family pesticide use and childhood brain cancer: Aroh.Envirion.Contam.Taxicol 1193 C24(1)87-92
18. Farewell JR. Dohrmann GJ, Flannery JT (1977). Central nervous system tumors in children cancer 40,3123-32.
19. Packer RJ, Schet LD, Bruce BA (1990) Brain tumors of pestrics cranial fosse in infant and children. In Neurological surgery, youmans J.R (ed) 2nded Philadelphia WB Saunders company.
20. Muller & Gurney JG 2005 epidemiology of pediatric brain tumors- pediatric neurosurgery 41:173-177
21. Ohgaki H, Kleihues P(2005) epidemiology and etiology of gliomas Aeta Neuropathol 109:93-108.
22. Balddwin RT. Preston- Martin(2004) Epidemiology of bain tumot in childhood – a review Taxicol appl Pharmacol: 199:1, 18-31
23. Preston- Martin S (2005) Beauty product related exposures and children brain tumor in seven countries: Results from the SEARCH International Brain tumor study J Neurooncal 72:133-147
24. Schuz J KAletsch U Kaatsch P. Meinnert R, Mischaelis J(2004)
25. Clap RW Jacobs MM, Loechler EL (2008) environmental and occupational causes of cancer New evidence:2005-2007, Rev Envirson Health 32:1-37
26. Efird JT, Holly EA, C Cordeir S, Muller BA, Lubin Filippini G, Peris, Bonet R, MC CredieM, Arsian A Bracci P.
27. Grover S and hardas VD (1972)- childhood malignancies in central india – J nail- cancer inst 49,55-9
28. Khan AB, Mckeen EA, ZAidi SHM(1983)- childhood cancer in Pakistan with special reference to retionoblastoma, J Pak Med associates 33,66-9
29. Gurney JG, Severson RK, Davis S, et al (1995) incidence of cancer in children in the United States- sex, race and year age specific rates by histologic type cancer 75,2186-95.
30. Rickert CH, Paulus W, Epidemiology of central nervous system tumors in childhood and adolescence based on the new WHO classification. Childs Nerv Syst;2001, 17:503-11



31. Zeman KU (1990) Pesticides fossa tumor in children, twenty months experience at Pims J Surg 1,18-20.
32. Wen Qing H, Shi-Ji Z Qing-sheng T, et al (1982) statistical analysis of central nervous system tumors in china. J Neurosurgery 56,535-64.
33. Frank AJ (1988) In: Diagnostic manual of tumors of the central nervous system longman group UK limited PP-142.
34. kaatsch p. rickert ch .kuhl J. schuz J et al ,population based epidemiological data on brain tumor in german children: cancer 2001: 92:3155- 64
35. Hjal mars U . kulldarff M . Wahlquist Y, lannering B. increased incidence rate but no space time clastrim of childhood astrocytoma in Swedan 1973-1992, a population based study of pediatric brain tumor cancer 1999:85:2077- 90
36. Karkoure M, Zafed S, Khattav M et al epidemiological profile of pediatric brain tumor in morocco, child nerv system 2010:26:1021-7
37. Mosso ML, Colombo R, Giordano L et al (1992) childhood cancer registry of presence of Zarino Italy survival, incidence, mortality over 20 years Cancer 69,1300-6

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