A Descriptive Study of Brain Tumors in Oncological Ward of Central Child Teaching Hospital

Matheel Mohammed Jaafar* CABP**, Ikhlas Ali Ahmed*** FICMS**, Shirouk Talib Saadoon*** CABP

ABSTRACT

Background: Brain tumors in children are heterogeneous groups of diseases that are collectively the second most frequent malignancy in childhood and adolescent. Each year, 30,000-40,000 children worldwide are diagnosed with brain tumors. It is the most common solid tumors diagnosed in children under the age of 15 years both in developed and developing countries.

Objective: To describe the pattern of brain tumors and their clinical presentations at the Central Child's Teaching Hospital in Baghdad of Iraq.

Methods: A cross-sectional study performed on twenty-three patients (less than 17 years of age) admitted to the Central Child's Teaching Hospital who were proved to have primary brain tumors which were documented by history, examination, imaging studies and histopathology (if present).

Results: Thirteen patients were males and ten patients were females and M:F ratio was 1.3:1. The age of the patients was between 4 and 12 years with a mean of 8.4 years. Infratentorial brain tumor was the commonest type apart from <5 years age group which showed supratentorial tumors to be the most common. The most common type of brain tumor was astrocytoma (35%) followed by craniopharyngioma (22%) then medulloblastoma and unclassified glioma in (17%) for each. The most common presenting symptoms in all patients was headache, convulsion followed by nausea and vomiting. Abnormal gait and ataxia were specific sign to infratentorial location of brain tumor, while, supratentorial brain tumors mostly presented with personality changes, emotional disturbance and decrease visual acuity.

Conclusions: Brain tumors present with different clinical signs and symptoms. Specific presentations and clinical examinations give us an idea regarding location of brain tumor. Full examination including neurological exam should be done to patient with suspicion to have brain tumor.

Keywords: Primary brain tumor, Intracranial pressure, Central Child Teaching Hospital.

Iraqi Medical Journal Vol. 68, No. 1, Jan-June 2022; p. 21-27.

Primary brain tumors (PBT), are a heterogeneous group of diseases that collectively are the second most frequent malignancy in childhood and adolescence after leukemia[1]. Each year, 30,000-40,000 children worldwide are diagnosed with brain tumors, the most common solid tumors diagnosed in children under the age of 15 years both in developed and developing countries[2,3]. The overall mortality among this group approaches 45%. Death caused by brain tumors are the highest among pediatric malignancies.

*Central Child Teaching Hospital, Baghdad, Iraq.

Nevertheless, there has been a 15% survival rate increase for children with brain tumors between 1975-1979 and 1995-2000 such that the overall survival is now 70%[4,5]. Among more than hundreds of histological categories and subtypes of primary brain tumors described in the WHO, five categories constitute 80% of all pediatric brain tumors[1].

1. Juvenile pilocytic astrocytoma.
2. Medulloblastoma (MB) / primitive neuroectodermal tumors.
3. Diffuse astrocytoma.
4. Ependymoma.
5. Craniopharyngioma.

The etiology of pediatric brain tumors is not well defined[4], could be familial, ionizing

radiation exposure[6], environmental exposure[7], also brain tumors may be seen in association with other cancers or as a result of their treatment[8].

There is no single clinical finding which is pathognomonic for diagnosis of children with PBT. The signs and symptoms may be a result of direct tumor infiltration into adjacent brain tissue, with or without spinal cord involvement, or a consequence of cerebral spinal fluid flow obstruction which leads to increase intracranial pressure (ICP), causing headache, vomiting, papilledema, anorexia, failure to thrive and cranial nerve palsy[4].

Supratentorial tumors (cerebrum, basal ganglia, thalamus, hypothalamus and optic chiasma) usually associated with signs and symptoms of increase ICP including hemiparesis, hemisensory loss, hyper-reflexia, seizure and visual complaint[4].

Infratentorial tumors (cerebellum and cranial nerves) usually associated with clumsiness, worsening of handwriting, motor weakness, slow slurred speech, lateralizing signs, dysmetria, nystagmus, truncal unsteadiness or signs of increase ICP[4].

Although a pathologic brain tumor diagnosis requires tissue biopsy, also skull x-ray, CT scan and brain MRI are important for diagnosis of brain tumor[4,9].

Optimal treatment of childhood brain tumors continues to be a great challenge that requires multidisciplinary approach involving many pediatric specialists, neuropathologists, neuro-oncologists, neuroradiologists, radiation oncologists, neurologists, pediatric neurosurgeon, ophthalmologists, physiatrists and physiotherapists[10].

This study aims to describe the pattern of brain tumors and their clinical presentations in the Central Child's Teaching Hospital oncological ward.

Methods

A cross-sectional study was carried out at the Child's Central Teaching Hospital (CCTH) in Baghdad city for 15 months (from the 1st of October 2019 to the 31st of December 2020). A total number of 23 patients below the age of 17 years with PBT, who were collected from the emergency, neurology and radiology department at the CCTH, were included in this study who proved to have PBT which was documented by history, examination, imaging studies and histopathology. Exclusion criteria include secondary tumor metastasis, brain cysts, pituitary adenomas, and vascular malformations.

The patients who were enrolled in the study were divided into three age groups: group 1: <5 years, group 2: 5-10 years and group 3: >10 years. Sex distribution, tumor location, histologic type in relation to age were analyzed and variable clinical features in relation to location of tumor whether infratentorial or supratentorial. The data characteristics were recorded from the relatives of the patient including: sociodemographic data (name, date of birth, sex, residence, and phone number), detailed history which includes (headache, nausea and vomiting, convulsion, personality changes and muscle weakness as well as full clinical examination: (neurological examination including cerebellar signs and cranial nerve examination as well as ophthalmological examination) and mode of diagnosis: topography, histopathological examination.

Diagnosis was made by clinical and radiological data with or without histopathological study in some cases. In some cases, in whom the type of PBT couldn't be confirmed neither by histological nor by radiological examination, therefore, these tumors were grouped together as unclassified gliomas.

Statistical analysis was used by SPSS software. A P value of less than 0.05 was considered for the reason of showing significance.

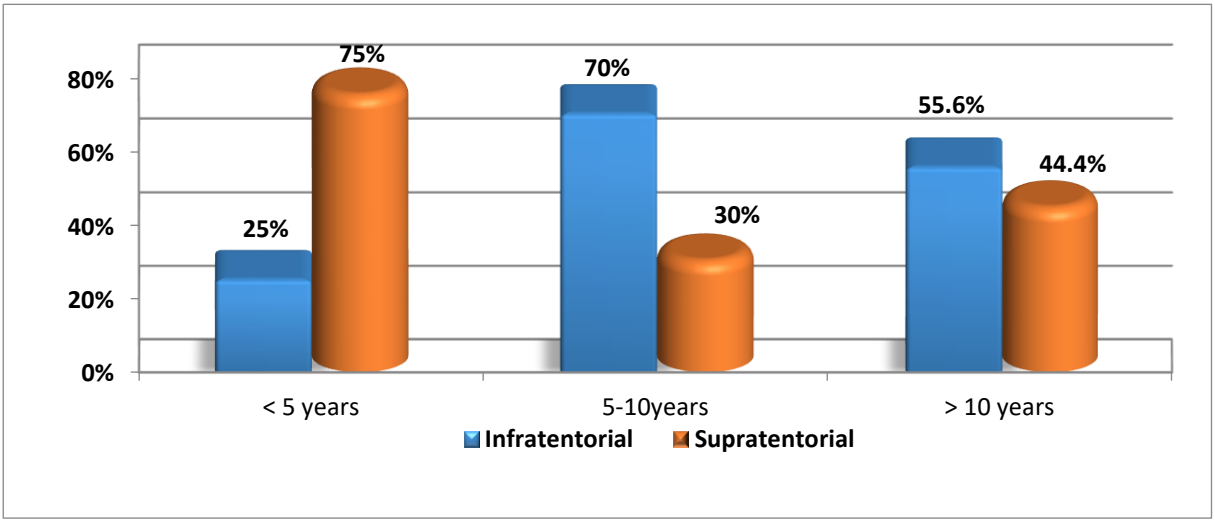
Results

Twenty-three patients met the requirement of this study and were included and submitted to analysis. Four patients

without histopathology results considered as unclassified gliomas. Five patients had a secondary tumor, two patients with arteriovenous malformation and one patient with brain cyst were excluded from this study. Thirteen patients were males and ten were females, so the male to female ratio is 1.3:1. The age of the patients was between 4 and 12 years with a mean of 8.4 ± 2.22 years.

In group 1, the supratentorial type of brain tumors was the most common type (n=3, 75%). While, in groups 2 and 3, the infratentorial type of brain tumor was the most common type (70% and 55.56%, respectively), P value < 0.001, (Figure 1).

Ten patients had supratentorial brain tumors (43.48%) and thirteen patients had infratentorial brain tumors (56.52%). The most common tumor was astrocytoma (8 patients, 34.78%) followed by craniopharyngioma (5 patients, 21.74%) then medulloblastoma and unclassified gliomas (4 patients each, 17.39%) and finally, meningioma (2 patients, 8.70%), P=0.014, (Table 1).



Chi square = 42, P. value = 0.00021

Figure 1: Distribution of primary brain tumor according to age groups.

Table 1: Distribution of types of brain tumors.

Type of brain tumors	No. of patients	Percentage
Meningioma	2	8.69
Medulloblastoma	4	17.39
Unclassified glioma	4	17.39
Craniopharyngioma	5	21.73
Astrocytoma	8	34.78
Total	23	100

In group 2, astrocytoma, meningioma, craniopharyngioma and unclassified gliomas were found almost equally. While in group 3, astrocytoma was the most common tumor (4 patients, 44.44%), while medulloblastoma and meningioma were not present, (Table 2).

In patients with supratentorial tumors the two most common symptoms were headache and convulsion that occurred in 10 patients for each (43.48%) followed by

nausea and vomiting in 9 patients (39.13%). Then, personality change and emotional disturbance occurred in 5 patients (21.74%). Squint and diplopia with motor weakness occurred in 1 patient for each (4.35%).

Infratentorial symptoms presented with a higher numbers and percentages. The most common symptom in infratentorial brain tumor was convulsion in 11 patients (47.82%) followed by headache in 10 patients (43.48%). Nausea and vomiting with abnormal gait occurred in 8 patients for each (34.78%) followed by squint and diplopia (4 patients) (17.39%). Personality change and emotional disturbance and motor weakness were not present in patients with infratentorial brain tumors, (Table 3).

Signs of supratentorial tumors were few, the most common sign was papilloedema in 7 patients (30.43%) followed by neck rigidity in five patients (21.74%). Two patients only had hyperactive reflexes with positive Babinski sign and affected trochlear IV and facial VII cranial nerves (8.70% for each), while, none had a decrease in visual acuity, optic atrophy, nystagmus, ataxia or Romberg sign.

Infratentorial signs were found in higher numbers, ataxia was the most common sign that occurred in 6 patients (26.09%) followed by a decrease in visual acuity in five patients (21.74%). Nystagmus and affected fourth and sixth cranial nerves were found in four patients (17.39%). Affected glossopharyngeal IX, vagus X and hypoglossal XII cranial nerves, neck rigidity, Romberg sign and optic atrophy were found in 13.04, 8.70, 4.35, and 4.35% respectively. (Table 4).

Table 2: The number of brain tumor types according to age group.

Age group	Astrocytoma	Craniopharyngioma	Medulloblastoma	Meningioma	Unclassified gliomas
1	2 (50%)	0 (0%)	1 (25%)	1 (25%)	0 (0%)
2	2 (20%)	2 (20%)	3(30%)	1 (10%)	2 (20%)
3	4 (44.4%)	3 (33.4%)	0(0%)	0(0%)	2(22.2%)
Total	8 (34.8%)	5(21.7%)	4(17.4%)	2(8.7%)	4(17.4%)

Table 3: The number of patients with symptoms of supratentorial and infratentorial brain tumors.

Symptom	Supratentorial (n=10)	Infratentorial (n=13)	X^2	P value
Headache	10 (100%)	10 (76.9%)	1.1	0.31
Nausea and vomiting	9 (90%)	8 (61.5%)	1.13	0.28
Convulsion	10 (100%)	11 (84.6%)	0.3	0.58
Squint and diplopia	2 (20%)	1 (7.7%)	0.7	0.80
Abnormal gait	0 (0%)	8 (61.5%)	6.9	0.008
Motor weakness	1 (10%)	0 (0%)	0.2	0.89
Personality change and emotional disturbance	5 (50%)	0 (0%)	5.6	0.017

Table 4: The number of patients with signs of supratentorial and infratentorial brain tumors.

Sign	Supratentorial n=10	infratentorial n=13	X^2	P
Decrease visual acuity	5 (50%)	0 (0%)	5.6	0.017
Papilloedema	5 (50%)	3 (23.1%)	0.8	0.36
Optic atrophy	0 (0%)	1 (7.7%)	0.2	0.90
Nystagmus	0 (0%)	4 (30.8%)	1.9	0.16
Ataxia	0 (0%)	6 (46.2%)	4.8	0.04
Romberg sign	0 (0%)	1 (7.7%)	0.2	0.90
Neck rigidity	5 (50%)	2 (15.4%)	0.43	0.52
Hyperactive reflexes and +ve Babinski	2 (20%)	0 (0%)	0.87	0.34
Affected IV and VI cranial nerves	2 (20%)	4 (30.8%)	0.1	0.92
Affected IX, X and XII cranial nerves	0 (0%)	3 (23.1%)	1.1	0.32

It had been significantly found that decrease visual acuity was more prevalent among cases with supratentorial tumors while optic atrophy and ataxia were more prevalent among cases with infratentorial tumor, P<0.05.

Other findings showed no significant differences in between both groups, P>0.05.

Discussion

Consistent with previous reports, our results suggest that boys are slightly more often affected than girls (1.3:1)[11,12]. In present study, the mean age at diagnosis was 8.4 years which was near to the results reported by Mehdi K et al[13], Cho KT et al[14] and Mehrazin M et al[15] (9.3, 7.8 and 8.8 years for these studies, respectively). No published local studies were found.

Also, we found that infratentorial location of brain tumor was most common among 5-10 years group which account (70%) and also most common in more than ten years group (55.6%) apart from group <5 years old which showed a higher supratentorial brain tumors (75%) in contrast to a study that is performed in Beijing by Dabiao Z in which all age groups had an infratentorial brain tumor except 15-17 years old group who had a supratentorial brain tumor[16]. This is may be a result of small sample size in the present study.

Regarding type of brain tumors, astrocytoma was the most common brain tumor (35%) followed by craniopharyngioma (22%). Our results were consistent with a study in Beijing by Dabiao Z who also found that astrocytoma was the most common tumor followed by craniopharyngioma[16]. While our results were inconsistent with reports from western countries that found medulloblastoma to be the most common type of pediatrics brain tumor followed by astrocytoma[11,17,18].

Previous reports suggest that craniopharyngiomas occur more frequently in children age 5-14 years with a higher incidence in Asia and Africa[16,19]. Most of the investigations have stated that craniopharyngiomas rank next to medulloblastomas in their incidence rate[11,17,18]. In our study, cranio-pharyngiomas made up approximately 22% of brain tumors only after astrocytic tumors which is similar to Beijing study result. Other studies found that medulloblastoma was the most common type of pediatric brain tumor in Morocco, followed by astrocytomas

which is consistent with findings of other published studies on pediatric brain tumors[13,14,20-22], while, medulloblastoma account 17% in the present study followed by unclassified gliomas 4% which lack of histopathological confirmation. Unfortunately, meningiomas account only 2% of tumors in the present study which has the best prognostic type which is similar to the results of Karkouki M in Morocco 2010 which accounted 2.2% [13].

Headache predominates as the most frequently reported symptom in hospital-based studies, reported for 33% to 41% of children with brain tumors[23,24]. Headache, convulsion and nausea and vomiting were the predominant symptoms that were shown in present study by the children with supratentorial and infratentorial brain tumors though the results of symptom were not significant regarding specificity to the brain tumor site (P value 0.31, 0.58 and 0.28, respectively). Results of abnormal gait were statistically significant for the infratentorial brain tumor (61.5% P value 0.008) and a strong correlation have been found between them suggesting abnormal gait as a strong indicator for the infratentorial location of the tumor (P value 0.04). Personality change and emotional disturbance were also significant statistically for the supratentorial location (50% P-value 0.017) suggesting the importance of this symptom to be correlated with that location.

Patients with supratentorial brain tumors had a strong relation to the sign of decrease visual acuity (50%) and the result was statistically significant (X^2 5.6 and P value 0.017). Ataxia (46.2%) was strongly associated with infratentorial brain tumor (P value 0.04). The results showed that decrease visual acuity and ataxia can be relied on for the determination of tumor site, while, the results for the other signs (papilloedema, optic atrophy, nystagmus, Romberg sign, neck rigidity, hyperactive reflexes and affected cranial nerves) though they are attributed to brain tumors, they were not significant regarding specifying the location of the tumor.

In conclusion; In children older than 5 years old, infratentorial location of brain tumors are more common than supratentorial tumors while in those less than five years old supratentorial location is more common. Signs and symptoms give us a clue about the site of brain tumor.

References

1. John F. Kuttesch, Jr. and Joann L. Ater. Brain tumors in childhood. In: Behrman RE, Kliegman RM, Jenson HB (edrs). Nelson Textbook of Pediatrics. 18th ed. Philadelphia. WB Saunders Co. 2007. P. 2128-37.
2. Amarti A, Ottmani S, Maher M, Bernoussi Z, Khalmlichi A, Saidi A. Central nervous system tumors in Morocco. Retrospective analysis of 2374 cases. J Neurosurg Sci 2009; 45:163-70.
3. Barr RD, Kasili EG. Caring for children with cancer in the developing world. In: Pochedly C (edr.). Neoplastic diseases of childhood, 2nd ed. Harwood Academic Publishers, London. 1994. P. 1535-58.
4. Susan M. Blaney, Larry E Kun, Jill Hunter, Lucy B. Rorke-Adams, Ching Lau, Douglas Strother, Ian F Poplack. Embryonal and pineal region tumors. In: Pizzo PA, Poplack DG, (eds). Principle and Practice of Pediatric Oncology, 5th ed. Lippincott Williams & Wilkins, Philadelphia, 2005. P. 786-864.
5. Jemal A, Clegg LX, Ward E, et al. Annual report to the nation on the status of cancer, 1975–2001, with a special feature regarding survival. Cancer 2004;101:3–27
6. Kimball D V, Gelber RD, Li F, et al. Second malignancies in patients treated for childhood acute lymphoblastic leukemia. J Clin Oncol 1998;16: 2848-53.
7. Bunin GR, Feuer EJ, Witman PA. Increasing incidence of childhood cancer: Report of 20 years' experience from the greater Delaware Valley Pediatric Tumor Registry. Paediatr Perinat Epidemiol 1996; 10: 319-38.
8. Neglia JL, Meadows AT, Zimmerman LE, et al. Bilateral retinoblastoma with ectopic intra-cranial retinoblastoma: trilateral retinoblastoma. Cancer Genet Cytogenet 1982; 5: 203-13.
9. Lanzkowsky P. Central Nervous System Malignancies. Manual of Pediatric Hematology and Oncology. 5th ed. Academic Press, Cambridge. 2005. P. 512-29.
10. Sandle M. Blaney, Larry E Kun, Jill Hunter, Lucy B. Rorke-Adams, Ching Lau, Douglas Strother, Ian F. Poplack In :Pizzo PA, Poplack DG, (eds). Principle and Practice of Pediatric Oncology, 5th ed. 2005. P. 786-864.
11. Rodriguez LA, Edwards MS, Levin VA. Management of hypothalamic gliomas in children: an analysis of 33 cases. Neurosurgery 1990; 26: 242-6.

12. Gurney JG, Davis S, Severson RK, et al: Trends in cancer incidence among children in the US. Cancer 1996; 78: 532-41.
13. Levy AS. Brain tumors in children: evaluation and management. Curr Probl Pediatr Adolesc Health Care 2005; 35: 230-45.
14. Sklar CA. Childhood brain tumors. J Pediatr Endocrinol Metab 2002; 2: 669-73.
15. Stiller CA, Nectoux J. International incidence of childhood brain and spinal tumors. Int J Epidemiol 1994; 23: 458-64.
16. Miltenburg D, Louw DF, Sutherland GR. Epidemiology of childhood brain tumors. Can J Neurol Sci 1996; 23: 118-22.
17. 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.
18. Wong TT, Ho DM, Chang KP, Yen SH, Guo WY, Chang FC, Liang ML, Pan HC, Chung WY. Primary pediatric brain tumors: statistics of Taipei VGH, Taiwan (1975–2004). Cancer 2005; 104:2156–2167
19. M. Karkouri, Sadia Zafad, Khattab M. et al. Epidemiologic profile of pediatric brain tumor in Morocco. Childs Nerv Syst 2010; 26: 1021-7.
20. Cho KT, Wang KC, Kim SK, Shin SH, Chi JG, Cho BK :Pediatric brain tumors: statistics of SNUH, Korea (1959–2000). Childs Nerv Syst 2002 18:30–37.
21. Mehrazin M, Yavari P. Morphological pattern and frequency of intracranial tumors in children. Childs Nerv Syst 2007;23:157-62.
22. Zhou D, Zhang Y, Liu H, Lou S, Lou L, Dai K. Epidemiology of nervous system tumors in children: A survey of 1485 cases in Beijing Taitan hospital from 2001-2005. Pediatr Neurosurg 2008; 44: 97-103.
23. Haupt R, Magnani C, Pavanello M, et al. Epidemiological aspects of craniopharyngioma. J Pediatr Endocrinol Metab 2006; 19 (suppl 1): 289-93.
24. Kaderali Z, Lamberti-Pasculli M, Rutka. The changing epidemiology of paediatric brain tumours: A review from the Hospital for Sick Children. Childs Nerv Syst 2009; 25:787-93.

IMJ 2022; 68(1): 21-27.