Clinical, radiological, and histopathological features and prognostic factors of brain tumors in children

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Abstract. Brain tumors are the second leading cause of death among cancers in children. Brain development continues until the age of 3 years; thus, brain tumors have varied clinical, radiological, and histopathological features. This study determined clinical, radiological, and histopathological features and prognostic factors for brain tumors in the pediatrics department of Faculty of Medicine Universitas Indonesia/Dr. Cipto Mangunkusumo Hospital Jakarta in 2010–2015. This retrospective cohort study included 88 children with primary brain tumors treated. Children aged <3 years experienced symptoms such as headaches (63%) and seizures (56%); based on the radiographs, the brain tumors were located mostly in the ventricular cerebrum (25%) and cerebellum (24%); based on the histopathology, the most common types of brain tumor were astrocytomas (31%) and medulloblastomas (25%). Children aged ≥3 years experienced symptoms such as headaches (81%) and impaired vision (65%); based on the radiographs, the brain tumors were located mostly in the cerebellum (24%) and the suprasellar region (10%); based on the histopathology, the most common types of brain tumor were medulloblastomas (21%), astrocytomas (18%), and gliomas (17%). The life expectancy rate for brain tumors was 37%. The most common symptom of a brain tumor was a headache. This study found no prognostic factors for brain tumors in children.

1. Introduction

Among diseases in society, brain tumors are rare. According to data from the American Cancer Society in 2014, they are, however, the second most prevalent cancer in children (18%), after leukemia (26%) and followed by lymphoma (14%) [1-4]. The specific anatomy of a child’s brain has two notable features: a thin skull contour and a large crown that is still open. In humans, the process of brain development continues till the age of 3 years. The location of brain tumors in children differs from that in adults: in children they lie in the infratentorial section, while in adults, they lie more often in the supratentorial section. This accounts for the difference between the symptoms of brain tumors in children and in adults [5-7]. A child may suffer brain tumor Progressive general cerebral disorder, high intracranial pressure, and specific brain symptoms may indicate that a child has a brain tumor. It is sometimes difficult to diagnose brain tumors based on physical examinations, because clinical symptoms vary greatly depending on the location and growth rate of the tumor; the rapid rise in
intracranial pressure and the effects of brain tumors result in compression, invasion, and tissue destruction [5]. Infants and young children are often unable to express verbal complaints; alternatively, their complaints are often regarded as common symptoms of illness resulting in parents being unaware of the real underlying causes; as a result, their children’s conditions go untreated. The symptoms of brain tumors are so varied that even parents sometimes do not recognize the cause; brain tumors are thus often difficult to diagnose early. Generally the patient presents in an advanced state [7].

The current success of brain tumor treatment has increased the life expectancy of such patients. Alston et al. (2003) found that the incidence of brain tumors in children under the age of 1 year is higher than that in children above the age of 1 year [8,9]. The success of brain tumor treatment depends on the child’s age, the type of surgery (total/partial), the histopathological examination, chemotherapy, and radiotherapy. Apart from late diagnosis, the success of the treatment is affected by other factors such as the patient’s condition at the first diagnosis and subsequent treatment [10].

Aditya Wicaksana et al. (2005) conducted a study of children with brain tumors with reference to the type of surgery and the adjuvant administration in the Department of Neurosurgery at Faculty of Medicine, Universitas Indonesia-Dr Cipto Mangunkusumo Hospital in Jakarta. The present study attempts to define the prognostic factors for brain tumors, but our results vary from those of the former study because of the difference in study design, sampling, duration of observation, and treatment [8,11]. This study aims to determine the clinical, radiological, and histopathological features, and risk factors of brain tumors in children, and also to compare the clinical, radiological, and histopathological features of this study with those of the previous study, to assist physicians determine the best treatment options for children with brain tumors, in turn increasing their life expectancy rate.

2. Methods
This study was conducted at the medical records unit and the Radiotherapy Department of Dr Cipto Mangunkusumo Hospital Jakarta. Data were collected during November 2014. The inclusion criteria were children aged between 1 month and 18 years, diagnosed with brain tumors, based on clinical manifestations and head CT scans or MRI of the head. Patients with brain tumors who had not undergone CT scans or MRI of the head were excluded. Samples were taken by consecutive sampling of medical records until we had acquired the required number of patients. Data were collected by filling in a prepared form.

Patient medical records were analyzed retrospectively over the previous 5 years (from 2010 to 2015) by looking at results from CT scans or MRI of the head and treatment options (surgical measures, radiotherapy, and chemotherapy). The baseline data of patients were identified and recorded, including identity, age, sex, CT scans/MRI of the head, histopathology examination, surgery, radiotherapy, and chemotherapy. Patients were grouped into those who survived and those who did not. Data were analyzed and tested using the chi-square test and survival analysis.

3. Results
Between January 2010 and October 2015, 100 subjects met the inclusion criteria. During this study period, the sample was followed up each time the subjects went for treatment. The brain tumors of two subjects had metastasized into leukemia and osteosarcoma. Thus, the survival analysis could be performed on 98 subjects. A total of 10 subjects were lost to follow-up, as they did not report to Dr Cipto Mangunkusumo Hospital Jakarta and could not be contacted by telephone. Thus, 88 subjects finally participated in the analysis. The 88 study participants comprised 47 males (53%) and 41 females (47%), with a ratio of 1.1:1. The age range of the subjects was 1 month to 18 years and the median was 8 years. Table 1 shows the group aged under 3 years, with a total of 16 subjects comprising 14 males (88%) and 2 females (12%), and the group aged 3 years and above, with a total of 72 subjects comprising 33 males (46%) and 39 females (54%). Table 1 shows that 12 patients (14%) presented with an early diagnosis, while 76 patients (86%) presented with a late diagnosis.
Table 1. General characteristics of subjects (N = 88).

| General characteristics | Age          | <3 years | ≥3 years |
|-------------------------|--------------|----------|----------|
|                         |              | (n = 16) | (n = 72) |
| Sex                     |              |          |          |
| Male                    | 47 (53%)     | 14 (88%) | 33 (46%) |
| Female                  | 41 (47%)     | 2 (12%)  | 39 (54%) |
| Diagnosis               |              |          |          |
| Early                   | 12 (14%)     | 2 (12.5%)| 10 (14%) |
| Late                    | 76 (86%)     | 14 (87.5%)| 62 (86%)|

Table 2 shows that in children aged under 3 years, the most frequent brain tumor symptoms were headaches (10 subjects, 63%), seizures (9 subjects, 56%), vomiting (8 subjects, 50%), and hemiparesis (8 subjects, 50%). In children aged 3 years and above, however, the most common symptoms were headaches (58 subjects, 81%), impaired vision (47 subjects, 65%), vomiting (36 subjects, 50%), and hemiparesis (31 subjects, 43%).

Table 2. Clinical characteristics of subjects based on age (N = 88).

| Clinical characteristics* | N  | <3 years | ≥3 years |
|---------------------------|----|----------|----------|
|                          |    | (n = 16) | (n = 72) |
| - Headache                | 68 | 10 (63%) | 58 (81%) |
| - Impaired vision         | 50 | 3 (19%)  | 47 (65%) |
| - Vomiting                | 44 | 8 (50%)  | 36 (50%) |
| - Seizures                | 29 | 9 (56%)  | 20 (28%) |
| - Balance disorders       | 19 | 3 (19%)  | 16 (22%) |
| - Hemiparesis             | 39 | 8 (50%)  | 31 (43%) |
| - Decreased consciousness | 31 | 6 (40%)  | 23 (32%) |
| - Paresis of the cranial nerve | 22 | 4 (25%)  | 18 (25%) |
| - Papilledema             | 15 | 0 (0%)   | 15 (21%) |
| - Macrocephaly            | 2  | 1 (6%)   | 1 (1%)   |

*one patient may have more than one symptom

Table 3. Clinical characteristics of subjects based on tumor location (N = 88).

| Clinical characteristics* | N     | Supratentorial (n = 42) | Infratentorial (n=46) |
|---------------------------|-------|------------------------|-----------------------|
|                          |       |                        |                       |
| - Headache                | 68    | 30 (71%)               | 38 (83%)              |
| - Impaired vision         | 50    | 26 (62%)               | 24 (52%)              |
| - Vomiting                | 44    | 20 (48%)               | 24 (52%)              |
| - Seizures                | 29    | 18 (43%)               | 11 (24%)              |
| - Balance disorders       | 19    | 2 (0.5%)               | 17 (37%)              |
| - Hemiparesis             | 39    | 17 (40.5%)             | 22 (48%)              |
| - Decreased consciousness | 29    | 16 (38%)               | 13 (28%)              |
| - Paresis of the cranial nerve | 22 | 11 (26%) | 11 (24%) |
| - Papilledema             | 15    | 9 (21%)                | 6 (13%)               |
| - Macrocephaly            | 2     | 1 (2%)                 | 1 (2%)                |

*one patient may have more than one symptom
Based on the location (Table 3), the symptoms of brain tumors on the supratentorial region were headaches (30 subjects, 71%), impaired vision (26 subjects, 62%), vomiting (20 subjects, 48%), and seizures (18 subjects, 43%). Symptoms of brain tumors on the infratentorial region were headaches (38 subjects, 83%), impaired vision (24 subjects, 52%), vomiting (24 subjects, 52%), and hemiparesis (22 subjects, 48%).

All subjects underwent a CT scan and/or MRI examination of the head. The CT scans showed 62 subjects with hydrocephalus and 39 with edema. The tumors were mostly in one location/single (80 subjects), but there were 10 subjects with multiple tumor locations. The tumors were found mostly in the infratentorial (47 subjects) and less frequently in the supratentorial (43 subjects).

Hydrocephalus was more common in children aged under 3 years (75%) than in those aged 3 years and above (69%). Single tumors were more common in children aged under 3 years, while multiple tumors were more common in those aged 3 years and above. Cerebral edema was only found in children younger than 3 years (100%). Radiological features in children aged under 3 years were hydrocephalus (100%) and edema (75%). There were more single tumors (61%) than multiple tumors (39%). Radiological features in children aged 3 years and above were hydrocephalus (69%) and edema (44%). Again, there were more single tumors (65%) than multiple tumors (35%).

Table 4. Radiological characteristics of subjects based on age (N = 88).

| Radiological characteristics | N   | <3 years (n = 16) | ≥3 years (n = 72) |
|-----------------------------|-----|------------------|------------------|
| **CT scan/MRI**             |     |                  |                  |
| - Hydrocephalus             | 62  | 12 (75%)         | 50 (69%)         |
| - Edema                     | 48  | 16 (100%)        | 32 (44%)         |
| - Single tumor              | 58  | 11 (69%)         | 47 (65%)         |
| - Multiple tumors           | 30  | 5 (31%)          | 25 (35%)         |
| **Tumor location**          |     |                  |                  |
| Cerebral ventricle          | 6   | 4 (25%)          | 2 (3%)           |
| Suprasellar                 | 8   | 1 (6%)           | 7 (10%)          |
| - Mid-brain                 | 4   | 0 (0%)           | 4 (6%)           |
| - Basal ganglia/thalamus    | 3   | 0 (0%)           | 3 (4%)           |
| - Brainstem                 | 4   | 0 (0%)           | 4 (6%)           |
| - Cerebellum                | 21  | 4 (25%)          | 17 (24%)         |
| - Ventricle IV              | 1   | 0 (0%)           | 1 (1%)           |
| - Infratentorial            | 5   | 2 (13%)          | 3 (4%)           |

Table 4 shows that in children aged under 3 years, the tumors located in the supratentorial were in the cerebral ventricle (4 subjects, 25%) and those in the infratentorial were in the cerebellum (4 subjects, 25%). In children aged 3 years and above, most tumors in the supratentorial were suprasellar (7 subjects, 10%) and those in the infratentorial were in the cerebellum (17 subjects, 24%). Table 5 shows the types of tumors based on MRI examination of the head and histopathology. The tumor types identified in radiological examination results are almost in accordance with those in the histopathological examination, particularly astrocytoma, medulloblastoma, and glioma.

Ten patients did not undergo histopathological examinations (Table 6): two were aged under 3 years and eight were aged 3 years and above. In children aged under 3 years, we found the tumor types were commonly astrocytoma (5 subjects, 31%), medulloblastoma (4 subjects, 25%), and papilloma plexus choroideus (2 subjects, 13%). In children aged 3 years and above, we found medulloblastoma (15 subjects, 21%), astrocytoma (13 subjects, 18%), and glioma (12 subjects, 17%).
Table 5. Types of tumors based on MRI and histopathology.

| MRI (N)                      | Histopathology                      | N  |
|------------------------------|-------------------------------------|----|
| Astrocytoma (18)             | Astrocytoma                         | 18 |
| Glioma (14)                  | Glioma                              | 12 |
|                              | Glioblastoma                        | 1  |
|                              | Oligodendroglioma                   | 2  |
| Medulloblastoma (20)         | Medulloblastoma                     | 19 |
| Meningioma (3)               | Meningioma                          | 2  |
| Tumor sellar region(10)      | Tumor suprasellar region            | 2  |
|                              | Pituitary adenoma                   | 1  |
|                              | Adamantinomatous craniopharyngioma  | 2  |
|                              | Craniopharyngioma                   | 5  |
| Pineal tumor(5)              | Pineal tumor                        | 3  |
|                              | Pineocytoma                         | 2  |
|                              | Pineoblastoma                       | 1  |
| Choroid plexus tumor (3)     | Papilloma plexus choroideus         | 3  |
| Unknown (5)                  | Teratoma CNS                        | 1  |
|                              | Germinoma                           | 1  |
|                              | Ependinoma                          | 3  |

N = 78

Table 6. Histopathological characteristics of subjects based on age (N = 88).

| Histopathological characteristics | N   | <3 years | ≥3 years |
|-----------------------------------|-----|---------|----------|
|                                   |     | (n = 14)| (n = 64) |
| - Astrocytoma                     | 18  | 5 (31%) | 13 (18%) |
| - Glioma                          | 12  | 0 (0%)  | 12 (17%) |
| - Medulloblastoma                 | 19  | 4 (25%) | 15 (21%) |
| - Craniopharyngioma              | 5   | 0 (0%)  | 5 (7%)   |
| - Pineal tumor                    | 3   | 0 (0%)  | 3 (4%)   |
| - Ependinoma                      | 3   | 0 (0%)  | 3 (4%)   |
| - Meningioma                      | 2   | 0 (0%)  | 2 (3%)   |
| - Pineocytoma                     | 2   | 0 (0%)  | 2 (3%)   |
| - Oligodendroglioma               | 2   | 0 (0%)  | 2 (3%)   |
| - Suprasellar tumor               | 2   | 0 (0%)  | 2 (3%)   |
| - Papilloma plexus choroideus     | 2   | 2 (13%) | 0 (0%)   |
| - Adamantinomatous craniopharyngi | 2   | 1 (6%)  | 1 (1%)   |
| - Others*                         | 5   | 2 (14%) | 3 (5%)   |

*multiple tumors found on one patient

Of the 88 subjects, 36 died and 52 survived. The cause of death was the progression of the underlying disease. The treatment options for brain tumors are surgery, radiotherapy, and chemotherapy. Among the subjects, 64 received surgery and 43 underwent surgery and radiotherapy, but not chemotherapy. Of the 24 patients who did not receive surgical treatment, only one patient with glioma received chemotherapy but not radiotherapy, and that patient is still alive. Of the eight patients who received only radiotherapy (without surgery or chemotherapy), three died and five lived. Of the 15 patients who did not receive surgery, radiotherapy, or chemotherapy, 9 died and 6 are still alive (See Table 7).
Table 7. Treatment and outcome of brain tumors.

| Outcome | Surgery (+) | Surgery (-) |
|---------|-------------|-------------|
|         | Radiotherapy (+) | Radiotherapy (-) |
| Died    | 2            | 13           | 0          | 8          | 0          | 3          | 1          | 9          |
| Survived| 2            | 30           | 0          | 9          | 0          | 5          | 0          | 6          |
| Total   | 4            | 43           | 0          | 17         | 0          | 8          | 1          | 15         |

As Table 8 shows, the most common tumors that appear in children are medulloblastoma, astrocytoma, and glioma, all tumors with a poor prognosis. The types of tumors with a good prognosis are adamantinomatous craniopharyngioma, glioblastoma, pituitary adenoma, germinoma, CNS germinoma, and pineoblastoma.

Table 8. Histopathological findings and prognosis.

| Histopathological | Total | Died | Survived |
|-------------------|-------|------|----------|
| Medulloblastoma    | 19    | 7 (37%) | 12 (63%) |
| Astrocytoma        | 18    | 7 (39%) | 11 (61%) |
| Glioma             | 12    | 5 (42%) | 7 (58%)  |
| Craniopharyngioma  | 5     | 1 (20%) | 4 (80%)  |
| Pineal tumor       | 3     | 1 (33%) | 2 (67%)  |
| Ependinoma         | 3     | 1 (33%) | 2 (67%)  |
| Papilloma plexus choroideus | 3 | 2 (67%) | 1 (33%) |
| Meningioma         | 2     | 1 (50%) | 1 (50%)  |
| Pineocytoma        | 2     | 2 (100%) | 0 (0%)   |
| Oligodendriglioma  | 2     | 1 (50%) | 1 (50%)  |
| Suprasellar tumor  | 2     | 2 (100%) | 0 (0%)   |
| Adamantinomatous craniopharyngioma | 2 | 0 (0%) | 2 (100%) |
| Glioblastoma       | 1     | 0 (0%) | 1 (100%) |
| Pituitary adenoma  | 1     | 0 (0%) | 1 (100%) |
| Germinoma          | 1     | 0 (0%) | 1 (100%) |
| Teratoma CNS       | 1     | 0 (0%) | 1 (100%) |
| Pineoblastoma      | 1     | 0 (0%) | 1 (100%) |
| Unknown            | 10    | 6 (60%) | 4 (40%)  |
| Total              | 88    | 36    | 52       |

This study was able to evaluate a total of 88 subjects, comprising 52 who survived and 36 who died, to determine the prognostic factors for subjects 6 (37.5%) who died aged under 3 years and 30 subjects (41.7%) who died aged 3 years and above. Of the subjects who presented with late diagnoses, 31 subjects (40.8%) died. Most of the tumors were located in the infratentorial, and resulted in the deaths of 19 subjects (41.3%).

Subjects performed by surgery Of the 64 subjects who underwent surgery, 23 died. Of the 24 subjects who did not undergo surgery, 11 are still alive. Table 9 shows the bivariate relationship between four risk factors: age, late diagnosis, tumor location, and surgical course and adjuvant radiotherapy. Statistical analysis showed that none of these could be a prognostic factor for death (p > 0.05).
Table 9. Prognostic factors of a child’s brain tumor (N = 88).

| No | Variable                       | Died (%) | Survived (%) | p    | OR   | IK 95 % |
|----|--------------------------------|----------|--------------|------|------|---------|
| 1  | Age                            |          |              |      |      |         |
|    | <3 years old                   | 6 (37.5) | 10 (62.5)    | 0.759| 0.840| 0.275–2.562 |
|    | ≥3 years old                   | 30 (41.7)| 42 (58.3)    |      |      |         |
| 2  | Late diagnosis                 |          |              |      |      |         |
|    | <3 weeks                       | 5 (41.7) | 7 (58.3)     | 0.954| 1.037| 0.301–3.567 |
|    | ≥3 weeks                       | 31 (40.8)| 45 (59.2)    |      |      |         |
| 3  | Location of tumor              |          |              |      |      |         |
|    | Supratentorial                 | 17 (40.5)| 25 (59.5)    | 0.937| 0.966| 0.413–2.263 |
|    | Infratentorial                 | 19 (41.3)| 27 (58.7)    |      |      |         |
| 4  | Surgery and radiotherapy       |          |              |      |      |         |
|    | Only surgery                   | 13 (54.2)| 11 (45.8)    | 0.121| 2.107| 0.813–5.456 |
|    | Surgery and radiotherapy       | 23 (35.9)| 41 (64.1)    |      |      |         |

Of 98 patients, 19 subjects aged under 3 years (19%) had a mean survival rate of 25.4 months (SE 5.791), while 79 subjects aged 3 years and above (81%) had a mean survival rate of 38.5 months (SE 5.289). Of the patients aged under 3 years, 10 died, 6 survived, and 3 were lost to follow-up. Of the patients aged 3 years and above, 42 died, 30 survived, and 7 were lost to follow-up (Table 10).

Table 10. Age relationship with survival (N = 98).

| Age              | Total subjects | % | Survived | Lost to follow-up | Died | Survival rate mean (SE) (months) | Value p |
|------------------|----------------|---|----------|-------------------|------|----------------------------------|---------|
| <3 years old     | 19             | 7 | 6        | 3                 | 10   | 25.4 (5.791)                     | 0.055   |
| ≥3 years old     | 79             | 33| 30       | 7                 | 42   | 38.5 (5.289)                     |         |

Survival is the time between diagnosis and death
SE: Standard Error, p = meaning (Log-rank)
A subject that is lost to follow-up is a subject that cannot be followed up.

Table 10 shows the results of age survival analysis with the Kaplan–Meier method and the log-rank test of 98 patients diagnosed with brain tumors that did not show significant differences in survival (p value = 0.055).
Figure 1 shows that the survival rate of children with brain tumors for 3 years (3-year survival rate) in the group aged under 3 years was 55% and that in the group aged 3 years and above was 60%. The survival rate of patients for 5 years (five-year survival rate) in the group aged under 3 years was 14% and that in the group aged 3 years above was 17%.

4. Discussion
In this retrospective cohort study, we aimed to identify the clinical, radiological, and histopathological features, and prognostic factors of brain tumors in children.

In children aged under 3 years, it is found that the most common clinical manifestations to be seizures, and at most physical examinations, hemiparesis and a decrease in consciousness were found. This is because in children aged under 3 years, the development of the nerves is immature, so the presence of lesions in the brain can cause seizures and decreased awareness. In children aged under 3 years, the tumor was located mostly in the cerebellum. This is consistent with the epidemiology of frequent tumor sites in the posterior fossa region of the cerebellum; such tumors may lead to an elevation of intracranial pressure, symptoms of vomiting, and decreased consciousness.

Radiological examinations of brain tumors were performed using CT scans and MRI. A CT scan may determine the shape and location of the tumor, while the MRI examination may determine not only the shape and location of the tumor but also the structure surrounding the tumor, with a high-resolution image. MRI can also determine the shape of the tumor in three dimensions, which is often necessary before performing surgery [7].

From the radiological features of brain tumors, the prevalence of hydrocephalus (67%) was established. The tumors were located more frequently in the infratentorial area (47 subjects) than in the supratentorial area (43 subjects). This is in line with the literature [8], in which brain tumors in children were located more frequently in the infratentorial area, although the comparison in that study differed, in that the ratio was 60%:40%. In our study, most brain tumors in the infratentorial were located in the cerebellum, while most brain tumors in the supratentorial were located in the cerebrum. Our study is similar to that of Furuta, in which the brain tumors of 46 children aged under 3 years were located in the cerebrum and cerebellum [7].

The most commonly occurring types of tumors both in children aged under 3 years and in children aged 3 years and above were astrocytomas and medulloblastomas; this is in accordance with the literature suggesting that the type of tumor in children is derived from the development of embryonic tumors—among others, medulloblastomas and astrocytomas.

In this study, of the 16 children aged under 3 years, 10 died (62.5%), while of the 74 children aged 3 years and above, 44 died (59.5%). The death rate of children aged under 3 years was higher than that
of children aged 3 years and above, but it did not show significant differences in survival (p value = 0.055).

Of the patients with a late diagnosis, 31 (40%) died. A delay in diagnosis results in inadequate treatment options. Of subjects with infratentorial tumor sites, 19 (41.3%) died. A tumor located in the infratentorial will more rapidly create intracranial pressure, often causing patients to present with severe symptoms; such patients should be treated as soon as possible for effective intervention.

The most common treatment plan for brain tumors is a combination of surgery, radiotherapy, and chemotherapy. With this combination, 75% of children diagnosed with brain tumors before the age of 20 have a life expectancy of 5 years [12].

Maximum surgical resection is essential to ensure optimal results for longer life expectancy. The tumor location and existing facilities make total surgery infeasible, so radiotherapy is required to destroy the tumor that is still left behind. Therefore, our study compared surgery alone with a combination of surgery and radiotherapy. Of the 64 subjects who underwent surgery, 47 also received adjuvant radiotherapy. Patients surviving a brain tumor for 5 years in the age group aged 3 years and above was better than that in children aged under 3 years (60% vs 55% and 17% vs 14%); this is because the brain of a child aged 3 years and above is more mature than that of a child aged under 3 years.

5. Conclusion
It can be concluded that seizures were clinically more common in children aged under 3 years who presented with brain tumors. Most physical examinations found hemiparesis and decreased consciousness. Radiological features revealed that most tumors were located in the ventricular cerebrum and cerebellum. The types of tumors, based on radiology, were astrocytic tumors, choroid plexus tumors, and pineal tumors. The most common histopathological features were astrocytomas, medulloblastomas, and papilloma plexus choroides. Children aged above 3 years were most likely to have headaches and visual impairment. Radiological features revealed that most tumor sites were in the cerebellum, suprasellar region, and cerebrum. The most common radiological types of tumors were astrocytic tumors, gliomas, and tumors in the sellar region. The histopathological images most frequently found were of medulloblastomas and astrocytomas. There was no correlation between age, tumor location, late diagnosis, or adjuvant radiotherapy therapy, on the one hand, and brain tumor prognostic factors, on the other. There was, however, an age correlation with survival of brain tumors in children. This study can serve as a basis for brain tumor survival analysis in children with histopathological types of risk factors and types of surgery.

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