

## **Our Experience Of Pediatric Brain Tumour In Medan: Demographic Study In Adam Malik General Hospital 2019-2020**

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### **Abstract**

**Introduction:** Primary brain and central nervous system tumors are the most prevalent and frequent neoplasm in children and adolescents aged 0 to 19 years. Brain and CNS tumors are the second leading cause of cancer-related deaths in children and adolescents aged 0 to 19 years old. Previous studies in several countries have reported the incidence rate of primary brain and CNS tumors in children and adolescent, ranged from 1.08 to 5.57 per 100,000 population. The incidence of brain tumor in pediatric patients has increased in the past decades, due to innovations in the imaging studies and the increase of benign form diagnoses. The highest occurrence of pediatric brain tumor is in the United States. Based on the study by Rictherova et al. in 2018, according to the age groups, the highest incidence is in adolescents aging 15-19 years with 6.38 per 100,000 children, followed by children aging under 1 year with 6.2 per 100,000 children.

**Method:** A total of 58 patients were reported in this study. Data was collected from medical bank data of Neurosurgical Department of Faculty of Medicine of North Sumatera in Indonesia. The variables that we collected were as follows: gender, tumor diagnosis, Glasgow-Coma Scale (GCS) score on admission, and age group. We classified age group into <1 year, 2-4 years, 5-9 years, 10-14 years, and 15-19 years old. The data was computed using the SPSS 25th edition.

**Result:** Out of 58 diagnosis, boys were the predominance frequency with a total of 69% and girls were 31%. most patients had medulloblastoma (27.6%) followed by glioma (24.1%), craniopharyngioma (8.6%), and meningioma (8.6%). Other types of tumor, namely cerebral abscess, cerebromalacia, choroid plexus papilloma, craniopharyngioma, ependymoma, neurofibromatosis 1, soft tissue tumor, were accounted for 1.7%, respectively

**Discussion:** Primary brain and central nervous system tumors are the most prevalent and frequent neoplasm in children and adolescents aged 0 to 19 years. Brain and CNS tumors are the second leading cause of cancer-related deaths in children and adolescents aged 0 to 19 years old. In our study, from a total of 58 patients, most of the patients (69%) were boys with a frequency of 40. Girls were only accounted for 18 (31%). A study by Stiller et al. in 2019 regarding incidence of childhood CNS tumors in Britain also reported similar result, with 2275 boys and 1891 girls out of 4166 tumor patients. The most common diagnosis was medulloblastoma (27.6%), in line with the study by Stiller et al. and Suresh et al. The most common age group with brain tumor was 10-14 years old (34.5%).

**Conclusion:** Based on our study, from the total of 58 patients, most of the patients were boys (69%). The most common tumor diagnosis in our study was medulloblastoma (27.6%) followed by glioma (24.1%). The results in our study had been in line with other literatures. However, the age group distribution was not in line with other literatures as our study reported the age group of 10-14 years old having the highest percentage of brain tumors. Overall, this study had reported the demographic result of pediatric brain tumor in Adam Malik General Hospital from 2019-2020.

**Keywords:** Brain tumor, pediatric brain tumor, population-based, Brain tumor incidence

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## **Introduction**

Primary brain and central nervous system tumors are the most prevalent and frequent neoplasm in children and adolescents aged 0 to 19 years. Brain and CNS tumors are the second leading cause of cancer-related deaths in children and adolescents aged 0 to 19 years old. Previous studies in several countries have reported the incidence rate of primary brain and CNS tumors in children and adolescent, ranged from 1.08 to 5.57 per 100,000 population. The incidence of brain tumor in pediatric patients has increased in the past decades, due to innovations in the imaging studies and the increase of benign form diagnoses.[1]

The incidence of pediatric CNS tumors worldwide varies with an average of 4 cases per 100,000 children. The highest occurrence is in the United States. Based on the study by Rictherova et al. in 2018, according to the age groups, the highest incidence is in adolescents aging 15-19 years with 6.38 per 100,000 children, followed by children aging under 1 year with 6.2 per 100,000 children. About 25-30% of tumors are in supratentorial localization, followed by the cerebellum (15-20%), brain stem (10-12%), pituitary and suprasellar region (10-15%), cranial nerves (6-7%), brain ventricles (5-6.4%), spinal cord (4.3-4.6%), and meningeal tumor (2.6-2.9%).[1], [2]

Brain tumor development has many risk factors, however, the verified risk factors are some hereditary syndromes such as neurofibromatosis type 1 and 2, tuberous sclerosis, Li-Fraumeni syndrome, Gorlin syndrome, Turcot syndrome, Cowden syndrome, etc. Other possible risk factors include a personal history of previous cancer treatment, family history of CNS tumor, parental age at the time of conception[1], [2]

The clinical manifestations are variable in relation to the location, age, infiltrative or mass effect behaviour. It is estimated that the most common histologies are astrocytoma, medulloblastoma, and craniopharyngioma.[2]

This study aims to record the descriptive data of pediatric brain tumor patients in Adam Malik Hospital.

## **Method**

A total of 58 patients were reported in this study. Data was collected from medical bank data of Neurosurgical Department of Faculty of Medicine of North Sumatera in Indonesia. The variables that we collected were as follows: gender, tumor diagnosis, Glasgow-Coma Scale (GCS) score on admission, and age group. We classified age group into <1 year, 2-4 years, 5-9 years, 10-14 years, and 15-19 years old. The data was computed using the SPSS 25<sup>th</sup> edition.

## Result

Of total from 58 patients, boys were the predominance frequency with a total of 40 patients (69.0%) and girls were 18 patients (31.0%). Most patients had a medulloblastoma (27.6%) as a post-craniectomy tumor diagnosis. The GCS score on admission were mostly 15 (70.7%). We also found that most patients in our study were within the age group of 10-14 years old.

**Table 1.** Data distribution based on gender.

	Frequency	Percentage
Boys	40	69.0
Girls	18	31.0
Total	58	100.0

Based on table 1, from a total of 58 patients, most of the patients (69%) were boys with a frequency of 40. Girls were only accounted for 18 (31%).

**Table 2.** Diagnosis of tumor

	Frequency	Percent
Arachnoid Cyst	3	5.2
Brain Metastasis	3	5.2
Cerebral Abscess	1	1.7
Cerebromalacia	1	1.7
Choroid Plexus Papilloma	1	1.7
Craniopharyngioma	6	9.3
Ependymoma	1	1.7
Glioma	15	25.8
Medulloblastoma	16	27.6
Meningioma	5	8.6
Neurofibromatosis 1	1	1.7

Pineal Tumor	2	3.4
Soft Tissue Tumor	1	1.7
Vestibular Schwannoma	2	3.4
Total	58	100.0

Table 2 showed the distribution of tumor diagnosis. Out of 58 diagnosis, most patients had medulloblastoma (27.6%) followed by glioma (25.8%), craniopharyngioma (9.3%), and meningioma (8.6%). Brain metastasis, arachnoid cysts, were accounted for 3 patients (5.2%), respectively. Other types of tumor, namely cerebral abscess, cerebromalacia, choroid plexus papilloma, craniopharyngioma, ependymoma, neurofibromatosis 1, soft tissue tumor, were accounted for 1.7%, respectively.

**Table 3.** The Glasgow-Coma Scale distribution of patients

GCS Score	Frequency	Percent
10	3	5.2
13	2	3.4
14	2	3.4
15	41	70.7
3	3	5.2
5	1	1.7
6	1	1.7
7	2	3.4
8	1	1.7
9	2	3.4
Total	58	100.0

Table 3 showed that most patients had a good GCS score with 70.7% had 15 scores followed by GCS score 10 and 3 (5.2%). Concerning GCS scores such as 3,5,6,7,8, and 9 were also reported in our study with a frequency of 5.2%, 1.7%, 1.7%, 3.4%, 1.7%, and 3.4%, respectively.

**Table 4.** Age group of patients with brain tumors.

Age group	Frequency	Percentage
<1 year	6	10.3
2-4 years	11	19.0
5-9 years	19	32.8
10-14 years	20	34.5
15-19 years	2	3.4
Total	58	100.0

Table 4 showed the age group distribution of pediatric patients with brain tumors. The age group of 10-14 years old had the highest percentage of 34.5% followed by 5-9 years old (32.8%), 2-4 years old (19.0%), <1 year old (10.3%), and 15-19 years old (3.4%).

## Discussion

Primary brain and central nervous system tumors are the most prevalent and frequent neoplasm in children and adolescents aged 0 to 19 years. Brain and CNS tumors are the second leading cause of cancer-related deaths in children and adolescents aged 0 to 19 years old. Previous studies in several countries have reported the incidence rate of primary brain and CNS tumors in children and adolescent, ranged from 1.08 to 5.57 per 100,000 population. The incidence of brain tumor in pediatric patients has increased in the past decades, due to innovations in the imaging studies and the increase of benign form diagnoses.[2]

The clinical manifestations are variable in relation to the location, age, infiltrative or mass effect behaviour. It is estimated that the most common histologies are astrocytoma, medulloblastoma, and craniopharyngioma.[1], [2]

Based on table 1, from a total of 58 patients, most of the patients (69%) were boys with a frequency of 40. Girls were only accounted for 18 (31%). A study by Stiller et al. in 2019 regarding incidence of childhood CNS tumors in Britain also reported similar result, with 2275 boys and 1891 girls out of 4166 tumor patients. A study by Corti et al. in 2018 regarding cognitive functioning of pediatric patients with brain tumor also reported similar result with 58.7% male and 41.3% female children. As

stated by the WHO classification of CNS tumors in childhood and adolescence, that the prevalence of this illness is higher for boys. A population-based analysis of demographic disparities in pediatric CNS cancer survival in the US by Fineberg et al. (2020) also reported a male predominance in their registry, accounting for 1035 (55.02%) compared to female with 846 (44.98%). [3], [5]

Table 2 showed the distribution of tumor diagnosis post craniectomy. Out of 58 diagnosis, most patients had medulloblastoma (27.6%) followed by glioma (24.1%), craniopharyngioma (8.6%), and meningioma (8.6%). A study by Stiller et al. (2019) also showed similar result with embryonal tumors accounted for 17% of registrations. Within this subgroup, 73% of patients were medulloblastoma with the highest incidence at the age of 1-9 years. A study by Suresh et al. in 2017 also reported medulloblastoma as the most common tumor found (34.6%). Gliomas accounted for 10% of registrations in the study by Stiller et al., with 80% of unspecified subtype. In our study, we found that glioma had the second highest frequency with 14 patients (24.1%). Glioma was also reported to be among the most common primary malignant brain tumor and its incidence has been sharply increased worldwide in the recent years. Meningioma in our study was reported for 8.6%. This result was not in line with the study by Othman et al. in 2020 which reported that meningioma had the highest incidence in their study population (n=105; 27.2%) followed by metastasis (n=70, 18.1%), and glioma (n=67; 17.4%). Othman et al. also found that there were more females (55.5%) than males (44.5%) in their study. On that note, one plausible reason for such high incidence of meningioma could be that meningioma occurred more in females than the opposite gender. Other types of tumor, namely cerebral abscess, cerebromalacia, choroid plexus papilloma, craniopharyngioma, ependymoma, neurofibromatosis 1, soft tissue tumor, were accounted for 1.7%, respectively. [3], [4], [5], [6], [7]

Table 3 showed that most patients had a good GCS score with 70.7% had 15 scores followed by GCS score 10 and 3 (5.2%). Concerning GCS scores such as 3,5,6,7,8, and 9 was also reported in our study with a frequency of 5.2%, 1.7%, 1.7%, 3.4%, 1.7%, and 3.4%, respectively. A study in Saudi Arabia by Alnaami et al. in 2018 also stated that most patients (91.7%) had a good post-operative recovery, however, one patient died (1.7%) and one was in a persistent vegetative state (1.7%). [8]

Table 4 showed the age group distribution of pediatric patients with brain tumors. The age group of 10-14 years old had the highest percentage of 34.5% followed by 5-9 years old (32.8%), 2-4 years old (19.0%), <1 year old (10.3%), and 15-19 years old (3.4%). This result was not in line with the study by Suresh et al. which stated that

age group of 0-4 years old had the highest percentage (50%). However, a study Othman et al. stated that there was an increased percentage between the age group of 1-10 to 11-20 years old. A study by Kang et al. in Korea in 2018 also stated that children aged 15 to 19 years had the highest incidence of childhood brain tumor both in Korea and the United States, followed by children aged 0 to 4 years, 5 to 9 years, and 10 to 14 years, respectively. This result was not in line with our study which stated that most patients were in the age group of 10-14 years old. The study by Kang et al. stated that the 10-14 years age group had the highest incidence of germ cell tumors and also stated that the incidence rate of germ cell tumors in Korea of the same group was 2.8-fold higher than that of the U.S children of the same age group[3], [4], [5], [6], [7], [8]

## Conclusion

Based on our study, from the total of 58 patients, most of the patients were boys (69%). The most common tumor diagnosis post craniectomy in our study was medulloblastoma (27.6%) followed by glioma (24.1%). Most of the patients in our study had a rather good GCS score with 70.7% having 15 GCS score. The age group distribution of pediatric patients with brain tumors was 10-14 years old. The results in our study had been in line with other literatures. However, the age group distribution was not in line with other literatures as our study reported the age group of 10-14 years old having the highest percentage of brain tumors. Overall, this study had reported the demographic result of pediatric brain tumor in Adam Malik General Hospital from 2019-2020.

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