Brain Tumor: A Review of Its Demographic in a Rural Hospital of Sibu in Sarawak, Malaysia

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Abstract

According to World Health Organization's GLOBOCAN 2012 database, brain tumors account for about 2% of all cancers in Malaysia. It was ranked 11th and 13th most common cancer among males and females, respectively. This debilitating disease can cause a tremendous burden to patients and their families and healthcare services. The main objective of this study is to provide demographic data on the type of brain tumors and their distribution of age and gender from the cases presented to the neurosurgical department of a rural hospital in Sibu from 2018 to 2021. This is a retrospective study of the incidence and pattern of brain tumors admitted to the Neurosurgery Department in Sibu Hospital. Data were emanated from the brain tumor registry census from 2018 to 2021. Of all cases, only cases with confirmed histopathological results were included. Inoperable brain tumors that were diagnosed through radiological investigations were excluded. There were 230 patients with brain tumors included in this study. Males constituted 42.6% ($n = 98$) of the cases, whereas 57.4% ($n = 132$) of them were female. The brain tumor was the least common in the pediatric group (0 to 10 years old) with only 3.5% ($n = 8$). The incidence of brain tumors increased with age and reached its peak in the age group of 51 to 60 years (34.8%). The commonest type of brain tumor was meningioma (38.7%), followed by a metastatic brain tumor (25.2%) and glioma (15.6%). Meningothelial WHO grade I was the most common variant that accounted for 67% ($n = 46$) of all meningioma. Lung carcinoma was found to be the most common primary, accounting for more than half (69.0%) of the metastatic brain tumors, followed by breast cancer (10.3%), thyroid cancer (8.6%), female genital tract (8.6%), and malignant melanoma (3.5%). The crude incidence of the brain tumor in Sibu was 4.98 per 100,000 population/year. This study showed that the commonest brain tumor in central rural of Sarawak was meningioma, followed by metastatic brain tumor and glioma. Meningothelial is the most frequent subtype of meningioma, whereas lung carcinoma was the commonest primary in brain metastases. The peak age group was 51 to 60 years old, and females showed a higher incidence than males. This study provides a baseline profile of the brain tumor spectrum in rural Sarawak. More data should be collected to aid in future research and healthcare planning.

Keywords
- brain tumor
- epidemiology
- Malaysia
- rural
- Sarawak

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Introduction

Brain tumors are relatively less common compared to other tumors in Malaysia. According to World Health Organization's GLOBOCAN 2012 database, brain tumors account for about 2% of all cancers in Malaysia.[1] The Malaysian National Cancer Registry Report (MNCRR) from 2012 to 2016 has ranked brain tumors as 14th and 15th most common cancer among males and females, respectively.[2] Thus, brain tumors are given less focus compared to other tumors although they can be the most vivid form of human diseases promptly fatality. This debilitating disease can cause a tremendous burden to the patients, their families, and healthcare services. Despite a few studies done in East Coast Malaysia (2017) and Terengganu (2020), there were limited data on brain tumors trend in a rural setting.

Sarawak is the largest among the 13 states in Malaysia. It has a population of 2.8 million across 124,450 km^2. Sarawak General Hospital (SGH) was the sole referral center of neurosurgery in Sarawak since 1988. However, many regions in Sarawak have diminished access to neurosurgery services due to its unique geographical challenges. For example, it takes about 15 hours to travel 900 km from the furthest hospital in Limbang to SGH. The long travel distances and time have markedly affected the outcome of the neurosurgical patient. Thus, to provide timely and immediate treatment, neurosurgical service was established in a district hospital in Sibu in 2013. The strategic location at the central zone has bridged the communications and triage across vast distances in rural locales. It is catered for the population of 1,153,000, from subdivisions of Sibu, Betong, Sarikei, Kapit, Mukah, and Bintulu.[3]

The primary purpose of this study was to provide demographic data on the type of brain tumors and their distribution of age and gender in the neurosurgical department of a district hospital. From these data, a comparison can be made to the other tertiary and its referral centers in Sarawak General Hospital (SGH).

Methods

This is a retrospective study of the incidence and pattern of brain tumors admitted to the Neurosurgery Department in Sibu Hospital. Data were emanated from the brain tumor registry census from 2018 to 2021. The information includes the incidence, age, and sex groups of brain tumor cases. Of all cases, only cases with confirmed histopathological results were included. However, The grading of brain tumors is not included in data collection for this study. Besides, inoperable brain tumors that were diagnosed through radiological investigations were also not included (►**Fig. 1**).

Results

There were 230 patients with brain tumors included in this study. Males constituted 42.6% ($n = 98$) of the cases, whereas 57.4% ($n = 132$) of them were female. The brain tumor was the least common in the pediatric group (0 to 12 years old) with only 3.5% ($n = 8$). The incidence of brain tumors increased with age and reached its peak in the age group of 51 to 60 years (34.8%). The commonest type of brain tumor was meningioma (38.7%), followed by a metastatic brain tumor (25.2%) and glioma (15.6%). Meningothelial WHO grade I was the most common variant, accounting for 69.7% ($n = 62$) of all meningioma. This was followed by atypical cell meningioma (9%), psammomatous (6.7%), clear cell (5.6%), microcystic (4.5%), and chordoid (4.5%). Lung carcinoma was found to be the most common primary, accounting for more than half (69.7%) of the metastatic brain tumors, followed by breast cancer (10.3%), thyroid cancer (8.6%), female genital tract (8.6%) and malignant melanoma (3.5%). The crude incidence of the brain tumor in Sibu was 4.98 per 100,000 population/year.

Discussion

This retrospective study of the epidemiology of brain tumors was carried out in Sibu Hospital. Sibu Neurosurgery Department was the first district neurosurgery service established in 2013. All neurosurgery cases were referred to SGH in Kuching before this. However, limited data on brain tumors have been collected since the establishment. Thus, this study was conducted specifically to provide comprehensive demographic data on brain tumors in a rural setting. This is essential to ascertain the estimation of the local disease burden.

The incidence of brain tumors worldwide ranged from 0.7 to 7.6 per 100,000 population/year.[4] It was reported the highest in Asia (52.26%), followed by Europe (21.8%).[5] MNCR (2012 to 2016) has reported that the incidence of brain tumors in Malaysia was 1.26 per 100,000 population/year.[2] It was significantly lower than the incidence reported in Terengganu (5.77 per 100,000 population/year in 2018) and Sarawak itself in 2012 (5.1 per 100,000 population/year).[4,6] The increasing trend of brain cancer is multifactorial. It could be attributed to the recent surge of environmental

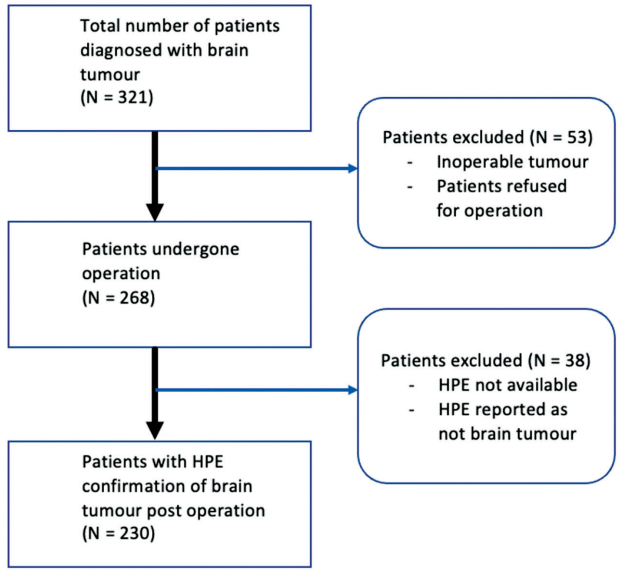

Fig. 1 Flow chart of patient selection based on inclusion and exclusion criteria.

Table 1 Distribution of patients by types of tumor, gender and age in the Department of Neurosurgery, Sibu Hospital. from 2018 to 2021

Gender	2018	2019	2020	2021	Total
Male	27	28	18	25	98 (42.6%)
Female	36	34	29	33	132 (57.4%)
Age Group					
1–12	1	5	1	1	8 (3.5%)
13–20	2	3	2	3	10 (4.3%)
21–30	7	7	6	7	27 (11.7%)
31–40	6	4	6	2	18 (7.8%)
41–50	9	8	8	8	33 (14.4%)
51–60	24	19	12	25	80 (34.8%)
61–70	11	11	10	11	43 (18.7%)
> 70	3	5	2	1	11 (4.8%)
Types of Tumor					
Glioma	11	10	5	10	36 (15.6%)
Meningioma	23	24	22	20	89 (38.7%)
- Meningothelial	16	16	15	15	62 (69.7%)
- Clear cell	1	1	2	1	5 (5.6%)
- Psammomatous	2	1	2	1	6 (6.7%)
- Atypical	2	4	1	1	8 (9.0%)
- Microcystic	1	1	1	1	4 (4.5%)
- Chordoid	1	1	1	1	4 (4.5%)
Schwannoma	4	4	3	5	16 (7.0%)
Lymphoma	2	2	2	2	8 (3.5%)
Pituitary tumor	1	1	1	1	4 (1.7%)
Metastases	16	17	10	15	58 (25.2%)
- Lungs	11	13	6	10	40 (69.0%)
- Breast	2	1	2	1	6 (10.3%)
- Thyroid	1	1	1	2	5 (8.6%)
- Skin	0	1	1	0	2 (3.5%)
- Female genital tract	2	1	0	2	5 (8.6%)
Germ cell Tumor	2	2	1	1	6 (2.6%)
Others	4	2	3	4	13 (5.7%)
Crude Incidence rate per 100,000	5.46	5.37	4.06	5.03	

pollutants, occupational exposures and industrial radioactive sources. However, it can also be explained by the accessibility of the more advanced facilities to diagnose the disease.[7] The recent availability of computed tomography imaging and magnetic resonance imaging has significantly resulted in higher detection rates of brain tumors. Many of these were previously prematurely diagnosed as strokes without diagnostic radio imaging.[8] For example, CT scan machines were only available in SGH and Sibu Hospital in the public sector of the whole Sarawak before 2009.[4] The long waiting list and troublesome traveling had averted any potential brain tumor cases, especially in the remote areas. However, a detailed study of the potential risk factors of brain tumors is not included in this study.

The incidence of brain tumors is closely related to age. Most brain tumors are being diagnosed in adults, with the highest incidences in patients aged 51 to 60 years (26%). These findings were consistent with Terengganu and Sarawak itself.[4,6] However, the incidence rate of brain tumors in a developed country such as the United Kingdom was reported to be the highest in patients more than 65 years old. This disparity could be due to the under-diagnosed of the elderly in Malaysia. Many of them had opted for conservative management instead of surgery due to frailty, multiple comorbidities, polypharmacy, and poor

social support. Thus, no histopathological confirmation can be obtained even after the imaging has been done. Nevertheless, this finding should alert the need to improve the management of brain tumors in the elderly.

In the study, the incidence rate of brain tumors was higher in females than males. The result is consistent with the other epidemiology studies on brain tumors in the United States (CBTRUS Statistical Report in 2019) and Malaysia.[4,6,9] However, Yusoff et al has reported that males were more preponderant to brain tumors overall in Kelantan except for meningioma and nerve sheath tumour.[10] The likely explanation could be that meningioma, which occurred more frequently in females, was our study's most common brain tumor. It accounted for 38.7% of all brain tumors. This result was higher than the studies done at Sarawak in 2002 and 2014, with 35% and 36%, respectively.[4,11] In contrast, the incidence rate of meningioma in the US was reported as 38.3%.[9] The mismatch could be related to a higher operation rate on the relatively "benign" meningioma. Other complicated brain tumors were sent over to tertiary centers such as SGH instead of being performed in the rural setting in Sibu. Thus, glioma, which had been reported as the most typical brain tumors that sharply increased worldwide, was ranked as the third most commonest brain tumor in this study. This also explained the low incidence of pituitary tumors in Sibu Hospital.

Brain metastases were the second most commonest brain tumors in the study. This was not surprising as Goh et al had already established a rising trend of metastatic brain tumors in Sarawak from 2009 to 2012.[4] This increasing trend was multifactorial such as the recent advances in therapeutic oncology, which resulted in higher survival rate, the availability of better immunohistochemical staining to diagnose the primary sources and the earlier screening programs. However, the exact number of brain metastases was still vastly underestimated. Brain metastases are generally associated with poor prognosis even after surgical resection, chemotherapy or radiotherapy. It reflected the advanced stage of disease whereby the palliation was the usual direction of care. They were less likely to be subjected to aggressive surgery or biopsy. Lung cancer was the most typical primary source of brain metastases (69.0%) in our study, followed by breast, thyroid, female genital tract and skin cancer. These findings were congruous with Goh et al in 2012.[4] The percentage of lung primary was reported to be as high as 80% in all brain tumours.[12] The study on the prevalence of brain metastases in the local setting is vital. It reflects the detection rate of the primary tumors and their control. The disease progression into brain metastases causes a significant burden on the public health system and the caretakers.

Conclusion

Meningioma was the commonest brain tumor in Sibu Hospital, followed by metastatic brain tumor and glioma. Meningothelial is the most frequent subtype of meningioma, whereas lung carcinoma was the commonest primary in brain metastases. The peak age group was 51 to 60 years old, and females showed a higher incidence than males. This study has shown no significant difference in brain tumor epidemiology in the rural setting. It provides a baseline profile of the brain tumor's spectrum in central Sarawak.

Conflict of Interest
None declared.

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