Demographic study of brain tumour in a neurosurgical department in Terengganu, Malaysia

Abdul Karim Othman (MMed Anaesth)[1], Nujaimin Udin (MS Neurosurgery)[2], Mas Shazanieza Shab (MD)[2], Nurul Ashikin Hamzah (MD)[2], Intan Suhana Munira Mat Azmi (MDPH)[1] ,Nyi Nyi Naing (MPH)[1]

[1]Faculty of Medicine, Universiti Sultan Zainal Abidin, Terengganu (UniSZA), Malaysia, [2]Neurosurgery Department, Hospital Sultanah Nurzahirah, Terengganu, Ministry of Health Malaysia

ABSTRACT

Introduction: Brain tumour (BT) is a tremendous burden on patients, families as well as the surrounding communities, especially the healthcare services. It can be classified into either a benign slow growing tumour (non-cancerous) and malignant tumour (cancerous). The purpose of this study was to determine the incidence and pattern of brain tumour admitted to the Neurosurgery Department in Hospital Sultanah Nurzahirah (HSNZ), Terengganu, Malaysia.

Methods: This is a retrospective study of incidence and pattern of BT admitted to the Neurosurgery Department in HSNZ. Data was collected from the yearly census of BT registered from 2013 to 2018.

Results: A total number of 386 new cases of primary BT were registered. The number of cases of BT was found to be lowest among children (0 to 10 years old) with only 4.4% but at peak among elderly aged between 51 to 60 years old (26.2%). As for gender, males constituted about 44.5% (n=172) whereas females accounted for 55.5% (n= 214) of the cases. In total, meningioma was found to have the highest incidence (27.2%) followed by metastases brain tumour (18.1%) and glioma (17.4%).

Conclusions: This study has shown that the incidence of BT was led by meningioma which had a high prevalence among the elderly population, followed by metastasis BT and gliomas.

KEYWORDS:
brain tumour, types, incidence

INTRODUCTION

Brain tumours (BT) can be divided into primary and metastatic tumours. Primary BT refers to a tumour that originates from the brain tissue and remain inside the brain. This is further divided into benign and malignant tumours. Examples of primary BT are meningioma, oligodendroglioma (glioma), astrocytoma (glioma), optic nerve glioma, craniopharyngioma, pituitary adenoma, Schwann cell tumour (nerve sheath tumour), ependymoma (glioma), brain stem glioma, medulloblastoma and pineal gland tumour. Metastatic BT refers to cancer cells that begin growing elsewhere in the body such as from lungs, breast, colon, skin (melanoma) but travel to the brain and form metastatic BT which travel to the brain through the bloodstream.[1]

A systematic analysis for the Global Burden of Disease Study (1990-2017) reported a total number of 405 000 cases of BT worldwide with the total deaths related to BT of 247 000 cases.[2] As for Malaysia, data from the World Health Organisation's Globocan 2012 database revealed a total number of 786 cases of brain BT and cancers were reported; representing 2.1% of all reported cancers in the same year. Data from the Malaysian National Cancer Registry Report (MNCRR) for 2007-2011 report that 2,236 new cases of brain and nervous system cancers were diagnosed which ranked as 11th and 13th most common cancer among males (1,176 new cases) and females (1,060 new cases) respectively.[3] The latest report from MNCRR for 2012-2016 revealed a total number of 2 097 cases of brain BT among the Malaysians with 1 117 cases among males and 908 cases females.[4]

It is hoped that these data will serve as the baseline information in acknowledging the trend of brain tumours in the future, especially for the brain tumour cases admitted to our neurosurgical department. The primary purpose of this study was to provide a demographic data on the type of brain tumours and the distribution of age and gender of the brain tumour cases presented to our neurosurgical department of Hospital Sultanah Nurzahirah (HSNZ) in Terengganu, Malaysia, and hopefully this effort will lead to better understanding of the demographic presentation of age and gender of the patient and also the type of BT involved and such information could be used to establish population-based Terengganu Brain Tumours Registry.

MATERIALS AND METHODS

Settings

This was an audit on demographic data of brain tumours presented to HSNZ from 2013 to 2018. The information includes the incidence, age, and sex groups of brain tumour cases. Data were collected from the yearly census of new brain tumours cases registered at the HSNZ from 2013 to 2018. The grading of BT is not included in data collection for this study, which mean that all grades of BT will be included.

Patients

All newly diagnosed BT cases (n=386) registered with the exclusion of recurrent brain tumours cases.

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Corresponding Author: Abdul Karim Othman
Email: neooptima@yahoo.com.my

Table I: Distribution of patients by types of brain tumours, age, and gender in Hospital Sultanah Nur Zahirah from 2013 to 2018

Variables	Frequency (%)					
	2013	2014	2015	2016	2017	2018
Gender						
Male	31 (56.4)	17 (37.8)	37 (52.1)	26 (44.8)	30 (34.9)	31 (43.7)
Female	24 (43.6)	28 (62.2)	34 (47.9)	32 (55.2)	56 (65.1)	40 (56.3)
Age group						
1 – 10	0 (0.0)	3 (6.7)	5 (7.0)	2 (3.4)	5 (5.8)	2 (2.8)
11 – 20	7 (12.7)	2 (4.4)	14 (19.7)	1 (1.7)	6 (7.0)	8 (11.3)
21 – 30	7 (12.7)	5 (11.1)	4 (5.6)	11 (19.0)	2 (2.3)	4 (5.6)
31 – 40	3 (5.5)	6 (13.3)	9 (12.7)	7 (12.1)	8 (9.3)	7 (9.9)
41 – 50	9 (16.4)	10 (22.2)	7 (9.9)	14 (24.1)	20 (23.3)	9 (12.7)
51 – 60	12 (21.8)	12 (26.7)	20 (28.2)	13 (22.4)	27 (31.4)	17 (23.9)
61 – 70	10 (18.2)	6 (13.3)	5 (7.0)	9 (15.5)	16 (18.6)	18 (25.4)
>70	7 (12.7)	1 (2.2)	7 (9.9)	1 (1.7)	2 (2.3)	6 (8.5)
Tumour types						
Glioma	13 (23.6)	10 (22.2)	14 (19.7)	11 (19.0)	11 (12.8)	8 (11.3)
Meningioma	15 (27.3)	15 (33.3)	11 (15.5)	18 (31.0)	25 (29.1)	21 (29.6)
Metastases	12 (21.8)	4 (8.8)	15 (21.1)	11 (19.0)	11 (12.8)	17 (23.9)
Spinal_tumor	3 (5.5)	2 (4.4)	4 (5.6)	0 (0.0)	1 (1.2)	0 (0.0)
Schwannoma	3 (5.5)	0 (0.0)	4 (5.6)	3 (5.2)	4 (4.7)	4 (5.6)
Pituitary_tumor	3 (5.5)	1 (2.2)	7 (9.9)	5 (8.6)	6 (7.0)	10 (14.1)
Primary_CNS_lymphoma	2 (3.6)	4 (8.8)	5 (7.0)	3 (5.2)	4 (4.7)	1 (1.4)
Pineal_tumor	1 (1.8)	0 (0.0)	0 (0.0)	2 (3.4)	2 (2.3)	3 (4.2)
Medulloblastoma	0 (0.0)	0 (0.0)	4 (5.6)	0 (0.0)	2 (2.3)	1 (1.4)
Others	3 (5.5)	9 (20.0)	7 (9.9)	5 (8.6)	20 (23.3)	6 (8.5)

Table II: Crude incidence rate of brain tumours in Hospital Sultanah Nur Zahirah from 2013 to 2018

Year	Number of Cases	Cumulative Percentage	Crude incidence rate per 100,000
2013	55	14.2	4.89
2014	45	25.9	3.95
2015	71	44.3	6.12
2016	58	59.3	4.92
2017	86	81.6	7.11
2018	71	100.0	5.77

Design

Data were extracted from yearly census of new brain tumours cases referred to HSNZ. The cases were diagnosed and classified according to the radiological investigations including computed tomography (CT) scan, and magnetic resonance imaging (MRI) and results obtained from the histopathological examination. Data were traced thoroughly to ensure correct diagnosis, and the diagnosis was made within the study period. For cases of inoperable BT, confirmation and classification were made according to the radiological examination.

Data Analysis

Data was entered and analysed using statistical software (SPSS version 22, SPSS Inc., Chicago, IL, USA). The data related to the gender, age and the type of brain tumours are presented in the form of frequency and percentage.

Ethical Consideration

This study was approved by the UniSZA Human and Research Ethical Committee (UHREC) and was purely a retrospective observational study in which the data was collected without any clinical intervention or use of any drug or medication to the patients thus, patients' consent was not required.

RESULTS

A total number of 386 new cases of primary BT were registered. Table I shows the distribution of patients by age, gender, and type of BT. From the data, the number of cases of BT was found to be lowest among children (0 to 10 years old) with only 4.4% but at peak among elderly aged between 51 to 60 years old (26.2%) (Figure 1). Annual number of cases diagnosed for BT according to each as group as detailed out in Figure 2. As for the gender, males constituted about 44.5% (n=172) whereas females were 55.5% (n=214) of the cases. The details of the distribution across the gender is as shown in Figure 3. In total, meningioma was found to have the highest incidence (27.2%) followed by metastases (18.1%) and glioma (17.4%). Although, annual data reported were varied, these tumours remain among the highest incidence compared to other tumours. The incidence of spinal tumour, pineal tumour, and medulloblastoma were recorded to be among the lowest with 2.6%, 2.1%, and 1.8% respectively. It is beyond the scope of this study to discuss the incidence of spinal tumours although it was included in the data collection. However, there were other tumours such as schwannoma and primary CNS lymphoma recorded to have the lowest incidence in year 2014 and 2018 correspondingly.

The crude incidence rate for BT is shown in Table II and this increased gradually ranging from 3.95 to 7.11 per 100 000 populations per year. This is in accordance with the trend

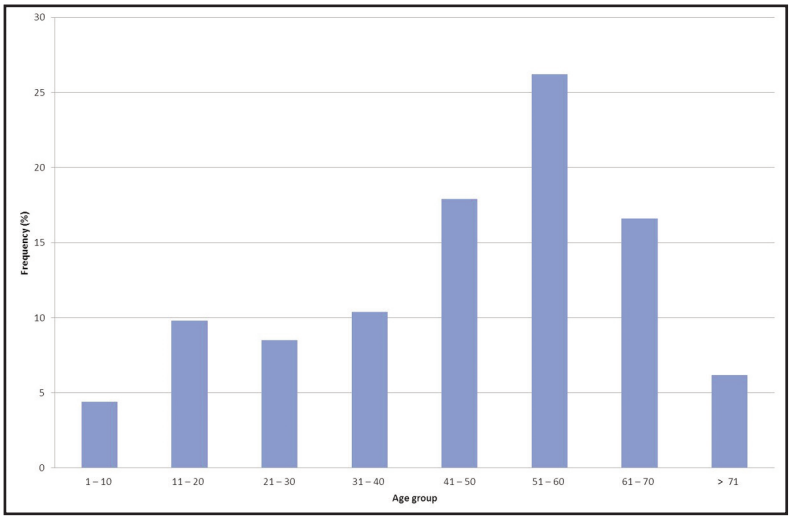

Fig. 1: Percentage of brain tumours according to age group from 2013 to 2018.

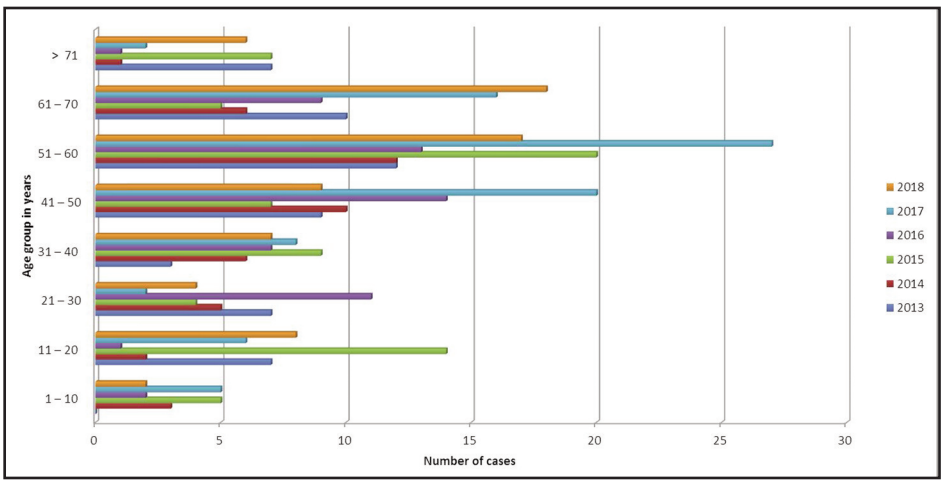

Fig. 1: Number of cases diagnosed for brain tumours according to age group from 2013 to 2018.

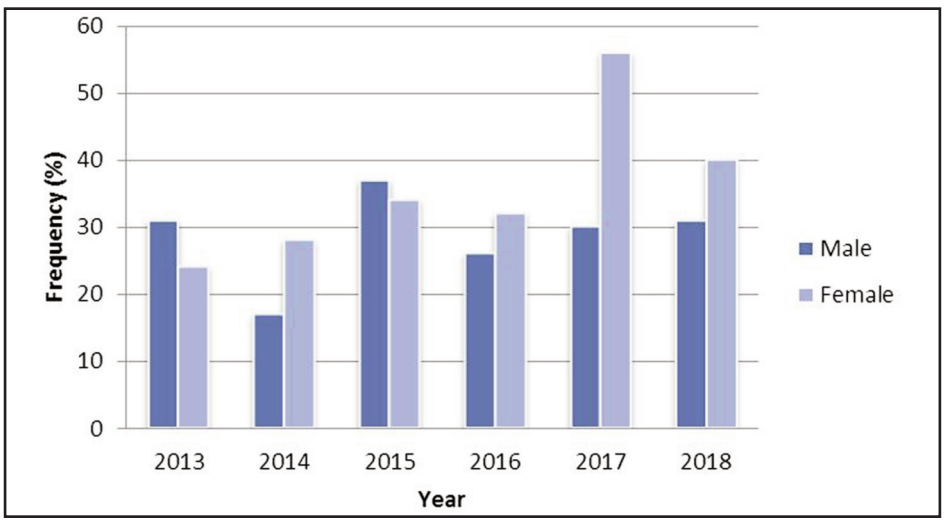

Fig. 3: Percentage of brain tumours according to age group from 2013 to 2018.

obtained from the APC (Annual Percent Change) of the incidence of BT in Terengganu that indicated the magnitude of the time period study has shown to be increased by 6.81 (Figure 4).

DISCUSSION

Department of Neurosurgery in HSNZ was established on 31st March 2011 and serves as a sole referral centre for neurosurgery cases for the state of Terengganu. Prior to this establishment, all neurosurgery cases including BT cases were referred and managed by neurosurgery department in the neighbouring state of Kelantan and Pahang. This study was conducted to specifically provide a comprehensive status of demographic data on brain tumours cases in HSNZ and descriptively foresee the incidence and trend of BT cases among the patients.

MNCR (2007 to 2011)[3] reported that the crude incidence of BT cases in Terengganu was 1.5 per 100 000 for male patients and 1.6 per 100 000 for female patients with the total incidence of brain tumours of 80 cases (male: 39 cases; female 41 cases). Without a neurosurgery department and brain tumours registry in the state of Terengganu, the exact burden and number of BT went under-reported and under-estimated. The temporal trend obtained from this study could be due to several reasons mainly with the improvement in brain tumours registrations, diagnosis, and clinical practice with the establishment of the neurosurgery department. Apart from that, the availability of imaging modalities especially CT scan and MRI play an important role. These imaging modalities have significantly resulted in higher detection rates and better differential diagnosis of BT which were previously misdiagnosed as strokes.[5] However, any environmental risk factors (such as pesticide, electromagnetic fields) could not be rolled out in which can be a potential risk factors for BT in explaining this temporal trend as it is beyond the scope of this study.

The incidence of BT is related to age, with the highest incidences being in older people. In this study, almost 30% of BT cases were patients 30 to 50 years of age. However, the major contribution of BT cases were patients more than 50 years' old which represented 50% of the total cases. Surprisingly, the biggest percentage came from the patients from the 50 to 60 years old (26.1%). However, in a developed country such as United Kingdom reported that the highest percentage of BT cases were patients more than 65 years olds, especially those 65 to 80 years olds.[6] This significant variation required a further explanation. Nevertheless, this finding may bring an important concern in the management of brain BT among elderly patients. As survival of BT patients has improved significantly, as earlier the survival among the elderly patients was only modest or dismal.[7]

In our study there were more females (55.5%) than males (44.5%) who were diagnosed with BT. This finding is similar with other studies including the epidemiological study conducted by Camille Pouchieu et al[8] and Goh CH et al.[9] One plausible reason could be that meningioma reported to have the highest incidence in our study which occurred more frequently in females than the opposite gender. With regard to the type of BT, meningioma represents the highest incidence of BT in our study population (n=105; 27.2%) followed by metastasis BT (n=70; 18.1%) and glioma (n=67; 17.4%) as the third most common type of BT. These findings showed a significant difference when comparing to the study done by Goh CH et al[9] in Sarawak in 2014 where it was shown that meningioma was recorded to have the highest incidence of brain tumours (32.2%) followed by glioma (21.7%) and metastasis brain tumours (14.1%). However, this study done by Goh CH et al[9] established a rising trend of metastasis BT the residents.

Other studies reported that meningioma rarely occurred in children, and women but more in men. Majority of meningiomas were noncancerous, with cancerous meningiomas were only approximately 1% of all primary BT. American Society of Clinical Oncology (ASCO) estimated that for people with non-malignant meningioma, a 10-year relative survival rate was 81.4%.[10] Clinical signs and symptoms of meningioma may range from a silent incidentaloma to lethal tumor.[11] Increase of an aging population should raise medical awareness of also an expectant rise in the incidence of meningioma throughout Malaysia, specifically in Terengganu.

The incidence of metastasis BT was the second highest in our study, which was preceded by meningiomas. All types of cancer can develop brain metastases.[12] Two thirds of brain metastases occurring in adult populations are secondary to lung cancer, breast cancer, and melanoma.[12] The increase in the incidence of metastases BT may be related to improved therapeutics which resulted in increased survival rate after the initial cancer diagnosis, increase in aging population, and improved in the diagnostic and screening methods resulting in earlier identification and initiation of treatment in patients with primary cancer.[13]

As the prevalence of metastases BT in Terengganu is alarming, there is the need to have a consistent and accurate understanding of the epidemiologic factors associated with this tumour. Hopefully, our information will assist the health care professionals in planning for the challenges of caring for the elderly aged group patients and developing good and effective preventative measures to decrease the likelihood of metastatic BT. This is because the increasing number of patients with metastatic BT will cause a great burden on the public health services as these groups of patients will strain the diagnostic, therapeutic, and research resources.[14] More importantly, metastatic BT are always an indication of poor prognosis, with short overall survival, progression-free survival, and neurological deterioration, with the target of treatment is to achieve a local control of the metastatic lesion, to improve the quality of life and to pervert death due to neurological disease.[15]

Meningioma, brain metastases and glioma were the three highest incidences of BT in this study population. However, study done by Rees et al[16] reported that glioma was among the most common primary malignant BT and the incidence of glioma has been sharply increased worldwide in the recent

years. Glioma has different types and the prognosis of gliomas depending on the grades is affected by many factors. However, even if treated with surgery combined with post-operative chemotherapy and radiotherapy, the prognosis will still be poor, as the recurrence rate is high.[17] In other words, gliomas are often aggressive, and the prognosis is poor, and the survival time is short.[18]

STUDY LIMITATION

This retrospective study only detected the demographic data of new BT patients referred to our neurosurgical department from 2013 till 2018. The imaging findings and histological data were reviewed from medical notes of patient. The grading of BT and the outcome of individual patient was not included in the data collected from this study.

CONCLUSION

Meningioma represented the commonest type of brain tumours followed by metastasis brain tumours and glioma. Patients more than 50 years old accounted for the highest contribution to the total BT cases in this study and females showed higher incidence compared with males.

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COMPLIANCE WITH ETHICS GUIDELINES

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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