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The Relationship between Cognitive Function and Quality of Life in Patient with Intracranial Tumors at Haji Adam Malik Hospital Medan

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ABSTRACT

Introduction: Cognitive function, which is also known as the higher cortical function, is the most important aspect in determining the independence of patient. In patients with intracranial tumors, the presence of a tumor can directly affect cognitive function which affects quality of life. Quality of life is an important component in clinical neurooncology, especially intracranial tumors in determining the independence and choice of therapeutic approach. However, research related to the relationship between cognitive function and quality of life is still minimal.
Method: This study used a cross-sectional method using an observational analytic approach in patients with intracranial tumors. The study subjects were 30 intracranial tumor patients and the MoCA-INA and Barthel Index were assessed.
Results: Of the 30 research subjects, the majority were female (60.0%), average age 49.8 years, university education (50.0%), and Javanese ethnicity (53.3%). Headache is the most common manifestation (83.3%). Most of the patients had tumor involvement of one lobe (63.3%), and located in the parietal lobe (63.3%). There is a significant relationship between cognitive function and quality of life of intracranial tumor patients ($p = 0.012$).
Conclusion: There is a relationship between cognitive function and quality of life of intracranial tumor patients.

Keywords

Cognitive, Intracranial tumor, Quality of life

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INTRODUCTION

Along with the increasing advances in medical technology and life expectancy, the incidence of brain tumors continues to increase. Brain tumors are capable of giving manifestations in the form of changes in mental status, neurological deficits which are a considerable social burden of patient.[1,2] Although primary and metastatic brain tumors cause significant morbidity and mortality, information regarding the epidemiology of brain tumors is still lacking, because data collection on brain tumor cases is not yet mandatory in several countries, including Indonesia. Then, the epidemiology of brain tumor data is still limited due to malignant brain tumors, so that the case of benign brain tumors is often ignored.[3]

The incidence rates of malignant brain tumors worldwide based on world population was 3.4 in 100,000 population, with a mortality rate of 4.25 in 100,000 population per year where mortality is higher in males. The incidence of brain tumors in America and Europe has increased from 17.6/100,000 to 22.0/100,000 population, where approximately 18,500 new cases of primary brain tumor are diagnosed each year and with high mortality rate of 3% for a 5 year survival rate.[2,4] In the previous study, 75 patients with tumors were found in ten hospitals in North Sumatra with almost the same proportion of males and females (50.7% : 49.3%) with an average age of 51.45 (11-87 years). The most common of clinical manifestation were headache and loss of consciousness.[5]

The main function of the brain for each lobe, both front, back, right and left, is cognitive function. Therefore, changes in cognitive function can actually act as a filter that is often overlooked by other visible neurological deficits. Cognitive impairment as an initial symptom appears up to 30%, equivalent to a headache. Cognition is essential for the complex activities of daily living, work, and functional independence, thus playing an important role in quality of life.[6-8] Therefore we aim to determine the relationship between cognitive function and quality of life in patients with intracranial tumors.

METHOD

This was an observational analytic study with a cross sectional design using primary data collected consecutively from patients with brain tumor who were treated in Haji Adam Malik General Hospital in September 2022 - June 2023 with the aim of finding the relationship between cognitive function and quality of life of intracranial tumor patients.

Subjects who participated in the study were patients who met the inclusion criteria, which are intracranial tumor patient diagnosed based on medical history, physical examination, neurological examination, and radiological examination and agreed to participate in this study by signing informed consent. The exclusion criteria in this study were patients with aphasia, visual impairment, movement disorder, and already perfomed surgery, chemotherapy, and radiotherapy.

Univariate analysis in this study was conducted to analyze the demographic characteristics of subjects. Numerical variables are presented by displaying the mean, standard deviation, median, (minimum-maximum). Bivariate analysis in this study was conducted to analyze the relationship between the research variables, in this case to determine the relationship between cognitive function and quality of life of intracranial tumor patients, the Mann Whitney test was used.

RESULT

This research was conducted from September 2022 to June 2023. The research subjects were intracranial tumor patients who were treated at H. Adam Malik Hospital in Medan and there were 30 patients who met the inclusion criteria and did not meet the exclusion criteria so they were included in this study.

Table 1. Demographic Characteristic of Intracranial Tumor Patient Treated in H. Adam Malik Hospital in Medan.

Demographic Characteristic	n = 30
Sex, n (%)	
Female	18 (60,0)
Male	12 (40,0)
Age, years	
Mean (SD)	49,8 (12,1)
Median (Min - Max)	48 (18 – 71)
Age, n (%)	
< 30 years	2 (6,7)
> 30 - 40 years	3 (10,0)
> 40 - 50 years	12 (40,0)
> 50 - 60 years	7 (23,3)
> 60 years	6 (20,0)
Ethnic, n (%)	
Bataknese	12 (40,0)
Mandailing	1 (3,3)
Javanese	16 (53,3)
Acehnese	1 (3,3)
Education Level, n (%)	
Elementary School	6 (20,0)
Junior High School	1 (3,3)
Senior High School	8 (26,7)
College	15 (50,0)

Based on sex characteristic, there were 18 female patients (60.0%) and 12 male patients (40.0%) of the 30 study subjects. The mean age of all study subjects was 49.8 ± 12.1 years with the most age group > 40-50 years, 12 patients (40.0%) and the least group being <30 years, 2 patients (6,7%). Based on ethnic group, the majority of subjects was the Javanese with 16 patients (53.3%) and the least ethnic were the Acehnese and Mandailing tribe with 1 patient (3.3%). Based on the education level of the subjects, they were college with 15 patients (50.0%) and the least was junior high school with 1 patient (3.3%) which summarize in the table 1.

According to clinical manifestations, the majority of intracranial tumor patients has headaches (83.3%), seizures (26.7%) and projectile vomiting (6.7%) (Table 2). Based on the quality of life assessment, the majority of patients have a low quality of life, where only 20.0% of them have a good quality of life while mild dependence (16.7%), moderate dependence (13.3%), severe dependence (33.3%) and total dependence (16.7%) which can be seen in Table. 3.

Based on statistical tests, cognitive function variables and quality of life variables were not normally distributed so they continued to test alternative analysis. Statistical data showed that there was a relationship between cognitive function and quality of life in intracranial tumor patients (p = 0.012) which can be seen in the Table 4.

Table 2. Characteristics of Clinical Manifestation in Patients with Intracranial Tumors

Clinical Manifestation	n = 30
Headache, n (%)	
Yes	25 (83,3)
No	5 (16,7)
Seizure, n (%)	
Yes	8 (26,7)
No	22 (73,3)
Vomitting, n (%)	
Yes	2 (6,7)
No	28 (93,3)

Table 3. Characteristics of Quality of Life in Patients with Intracranial Tumors at H. Adam Malik General Hospital Medan.

Characteristics	n = 30
Quality of Life, n (%)	
Normal	6 (20,0)
Mild	5 (16,7)
Moderate	4 (13,3)
Severe	10 (33,3)
Total	5 (16,7)

Table 4. Correlation between Cognitive Function Impairment and Quality of Life in Intracranial Tumor Patients

Quality of Life	Cognitive		p
	Abnormal	Normal	
Barthel Index	9,7 ± 5,1	20,0 ± 0,0	0,012

*Mann Whitney Test

DISCUSSION

Based on sex characteristics, there were 18 female patients (60.0%) of the 30 study subjects. The mean age of all study subjects was 49.8 ± 12.1 years, with the largest age group being > 40-50 years, 12 patients (40%). This is consistent with previous study conducted by Erwin et al (2017) with an average age of 45.41 ± 13.29 years [9], Kharisma et al (2021) with an average age of 48.03 ± 1.97 years [10], Maharani et al (2018) with an average age of 43.7 ± 11.5 years [11], where in Indonesia based on data from the Department of Neurology at Cipto Mangunkusumo Hospital, in 2011-2015 the average patient age was 48 (18-74) years [12,13] and in Ostrom et al's study in Erwin et al (2017) with a median age of 59 years [9], as well as research by Putri et al (2022) for the period 2019-2021 found 68% of primary intracranial tumor patients in the age range of 40-59

years.[14] The ethnic group with the most number of subjects was the Javanese with 16 patients (53.3%). This is not similar with the previous study of Kharisma et al (2021) where the most ethnic group is the Batak tribe with a percentage of 73.3%. Based on the level of education, the subjects were college with 15 patients (50.0%). However, this is not similar to the previous of Kharisma et al (2021) with the education level of most brain tumor patients being high school (56.7%).[10] The difference in this study was due to advances in technology and knowledge and self-awareness in patients who were more critical and try to find out the causes of symptoms that make patient that interfere with patient daily activities. However, the current guideline for brain tumors states that there was limited data due to national multicenter data regarding the proportion and epidemiology of brain tumors.[9]

According to clinical manifestations, the majority of intracranial tumor patients complained of headaches (83.3%). This is similar to the results of Kharisma et al study (2021) where the most common symptom was headache 83.8% and Putri et al study (2022) was headache 88%.[10,14] Headaches can arise from mass effect causing increased intracranial pressure (ICP).[12]

In general, there are no pathognomic clinical manifestations of intracranial tumors, and most patients at early stage have non-specific symptoms. Intracranial tumors have clinical neurological manifestations with various systemic complications, depending on the location and volume of the intracranial tumor lesion. The space-occupying effect is not only caused by the mass, but also due to the effect of the surrounding edema, so it is easier for intracranial enlargement to occur along with an increase in the size of the tumor mass, so that neurological symptoms represent the location of the tumor and tumor development compared with the histology of intracranial tumors. Symptoms may occur due to intracranial pressure such as headache, seizure, and projectile vomiting. Headache is the most common and early manifestation found in patients with intracranial tumors. Pain can also caused by compression on the blood vessels and sinuses or also due to direct stimulation of pain receptors by tumors, so that it can cause severe pain in brain tumor patient.[12]

Patients with intracranial tumors have their own challenges, especially in terms of quality of life. Most patients are severely affected by general clinical symptoms such as headaches, anorexia, seizures, and insomnia. Patients also often face worsening of focal neurological deficits including motor deficits, behavioral disturbances, cognitive deficits, and visual disturbances.[15] Associated with the degree of severity of intracranial tumors greatly affects survival, quality of life, and psychosocial in patients with intracranial tumors.[16] Several methods in assessing the quality of life in patients with intracranial tumors which is Barthel index.[17,18]

Based on previous study Torres-Perez et al (2021), data shows majority patient with brain tumor has a lower Barthel index in patients with preoperative intracranial tumors.17 In line with this study, analytical statistic test showing that the majority of patients have a low quality of life, where only 20.0% some of them have a good quality of life while mild dependence (16.7%), moderate dependence (13.3%), severe dependence (33.3%), and total dependence (16.7%). Another study by Lundar et al (2021), patients with a good quality of life before preoperative action had a higher survival compared to those who were low score.[19] Previous study Krajewski et al (2022), data showed preoperative intracranial tumor patients with a high Barthel index, correlated with good quality of life in postoperative patients.[20]

Based on statistical tests, data showed that there was a relationship between cognitive function and quality of life in patients with intracranial tumors ($p = 0.012$). Based on these data it can be concluded that the worse the cognitive function, the worse the quality of life and the higher the level of dependence on other people to carry out daily activities which will have an impact on the quality of life where the patient is unable to independently take care of his personal needs. This is relevant to the results of previous study Solanki et al (2017) which stated that there was a significant relationship between quality of life and cognitive impairment in patients with brain tumors [21] and study Nieuwenhuizen et al (2013) also stated that quality of life was worse in patients with neurocognitive deficits.[22] but in the study of Habets et al (2014), the data shows the relationship between cognitive function and quality of life varies.[23] Where this variation can also be due to the association with cognitive function and quality of life in old age, which can be seen in the research by

Lange et al (2014) which shows data on the relationship between quality of life and cognitive function is also affected by age.[24] Each of these cognitive domains cannot work alone to carry out its functions, but as a unit called the limbic system. Apart from the limbic system, other brain lobes also play a role in cognitive function, both the frontal, parietal, temporal, and occipital lobes.[25] So that with damage to certain areas can result in impaired cognitive function.

The patient's quality of life greatly influences treatment adherence and is strongly influenced by the quality of diagnostic and therapeutic communication.[26] Therefore, changes in cognitive function can actually act as a filter that is often overlooked by other visible neurological deficits. Cognitive impairment as an initial symptom occurs in up to 30%, equivalent to a headache.[9] Cognition is essential for complex activities of daily living, work, and functional independence, thus playing an important role in quality of life.[10]

In this study there were several limitations, the research was using a cross-sectional data collection method so that the findings in this study needed to use longitudinal studies so that the results obtained were more representative. Several other factors that may affect cognitive function in intracranial tumor patients who have exclusion criteria, socioeconomic factors, ages factors and so on were not analyzed in this study. So that it can lead to difficulties in determine that the quality of life of patients is affected by the cognitive function of intracranial tumor patients who have not undergone surgery or chemoradiation.

CONCLUSION

There is a relationship between cognitive function and quality of life of intracranial tumor patients.

DECLARATIONS

Ethics approval and consent to participate. Permission for this study was obtained from the Ethics Committee of Universitas Sumatera Utara and Haji Adam Malik General Hospital.

CONSENT FOR PUBLICATION

The Authors agree to publication in Journal of Society Medicine.

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COMPETING INTERESTS

The authors declare that there is no conflict of interest.

AUTHORS' CONTRIBUTIONS

All authors significantly contribute to the work reported, whether in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas. Contribute to drafting, revising, or critically reviewing the article. Approved the final version to be published, agreed on the journal to be submitted, and agreed to be accountable for all aspects of the work.

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