

# Assessment of Cognitive Impairments, Depression, Anxiety and Quality of Life among Brain Tumor Patients and Healthy Adults

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## ABSTRACT

**Purpose:** This study was conducted to assess cognitive impairments, depression, anxiety and quality of life among patients with brain tumor and healthy adults, comparatively.

**Methods:** A cross-sectional study was administrated on 84 brain tumor patients and 84 healthy adults measured by the mini mental state examination, Beck, Hamilton and SF36 questionnaires before and after 10 days of surgery.

**Results:** This study showed that cognitive impairment, depression and anxiety increased in brain tumor patients after surgery but quality of life did not changed.

**Conclusion:** Findings of current study show the necessity of cognitive and mental assessments before and after surgery and emphasizes on the need for rehabilitation and treatment.

**Keywords:** Cognitive impairment; Depression; Anxiety; Quality of Life; Adults

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## INTRODUCTION

The term of brain tumor apply to a set of neoplasm with especial biology, diagnosis and treatment. For the reason that these tumors originate from brain tissues, they defined as intracranial neoplasm<sup>1</sup>. The recent studies indicated that brain tumor have been increased in last 30 years. Patients with brain tumor have faced to serious challenges. They have difficulties like headache, anorexia, nausea, seizures and insomnia which cause cognitive and psychiatric changes<sup>2,3</sup>. In these patients cognitive impairment, depression and anxiety can affect by lesion location. Depression resulted in surgery of brain's left side and anxiety resulted in surgery of brain's right side<sup>4,5</sup>. Also patients with brain tumor encounter with cognitive difficulties like fatigue, sleep disorders and pain and also they have difficulties with quality of life including mood and cognitive dimensions<sup>6,7</sup>. Patients treated surgically are more likely to have cognitive impairment than those

treated nonsurgically<sup>8</sup>.

Dealing with psychiatric and cognitive challenges in brain tumor is a difficult task for patients<sup>9</sup>. Some previous studies have emphasized on cognitive aspects rather than psychiatric aspects. Some of them focus on quality of life patients with brain tumor<sup>10,11</sup>.

The evaluation of cognitive functioning has prognostic value<sup>12-14</sup>. Among brain tumor patients, depression, anxiety, fatigue, sleep disorders and cognitive impairment are a symptom that explained 29% of the variance in quality of life which these symptoms explicated brain functioning impairment<sup>15</sup>. The findings in some studies that illustrated reduce survival among brain tumor patient with cognitive changes especially among patients with a low-grade disease<sup>16-19</sup>. In addition, higher measure of depression has relation with lower quality of life<sup>12,17,20</sup>. Quality of life is important in clinical neurooncology and increasingly is relevant with survivorship increases

and patient that experienced potential disease with new therapies<sup>21</sup>. The aim of reviewing patient's quality of life is summarize what is known about quality of life in brain tumor patients and also suggesting that how uses it directly in prospective researches<sup>22-24</sup>. The differences in quality of life may be fewer dependants on the grade of tumor and more dependants on whether the tumor is stable or advanced<sup>25</sup>. Brain tumor patient with lower quality of life tended to become worse<sup>26</sup>.

Quality of life for brain tumor patients is an important endpoint because they have a poor prognostic<sup>27</sup>. Quality of life has multidimensional concept which could be affected by cognitive impairment, depression and anxiety<sup>28</sup>. Therefore the aim of this study is comparative assessment of cognitive changes, depression, anxiety and quality of life change in brain tumor patients before and after surgery with healthy adults.

## MATERIALS AND METHODS

### Participants

The type of study was cross-sectional and simple randomized method was applied. Two groups of subjects participated in this study, the first group was the patients with brain tumor who referred for surgery to Shohada hospital and another group was healthy adults who referred through recalling in functional neurosurgery research center (FNRC) of Shahid Beheshti medical University in Tehran. Before research participants enter the study, it was essential to complete the informed consent and demographic questionnaire.

First, patients examined by neurosurgeon, neurologist and psychiatrist then after were done magnetic resonance imaging (MRI), they have been introduced for surgery and before surgery the permission was taken from them and finally entered the study. Also, the ongoing study was approved in ethic committee and research faculty of Shahid Beheshti University of Medical Sciences. The example group has been considered 84 who were matched for age, sex, education. The patients who have hydrocephalic, retardation or mental disease have been omitted from study.

The population study was selected through simple random sampling, 15-65 years old of 84 (42 male and 42 female) healthy Iranian subjects whose mean age was 46±3. Filling the informed consent letter before entering the study was necessary for the whole subjects. Afterwards, they were examined by neurosurgeons, neurologists and psychiatrists in order to be removed in case of noticing any disease. Healthy participants after being confirmed by the mentioned physicians were

referred to perform the tests. Inclusion criteria were as follows: healthy people free from previous or current history of psychological and neurological disorders, no history of head injury, lack of learning disability, living in Tehran, Farsi speaker and aged from 15-65 years old. Exclusion criteria were as follows: having a previous or current history of psychological and neurological disorders, head injury, learning disability, not living in Tehran, non-Farsi speaker and not aged from 15-65 years old. This study has been compromised in ethic committee and research faculty of Shahid Beheshti University of Medical Sciences and has been approved and implemented in Functional Neurosurgery Research Center (FNRC).

### Measures

Data collection techniques:

Data collection instruments in patients and healthy adults were:

1. Demographic questionnaire
2. Beck Depression questionnaire
3. Hamilton Anxiety questionnaire
4. MMSE questionnaire
5. SF 36 questionnaire

**1. Demographic characteristic:** Including age, sex, and marital status, number of child, education, occupation, history of disease, smoking, medicine consumption history, economical statue, social and communicative statue, and headache.

**2. Cognitive assessment:** Through MMSE questionnaire, the Mini Mental State Examination is a tool that can be used to systematically and thoroughly assess mental status. It is an 11-question measure that tests five areas of cognitive function: orientation, registration, attention and calculation, recall, and language. The maximum score is 30. A score of 23 or lower is indicative of cognitive impairment. The MMSE takes only 5-10 minutes to administer and is therefore practical to use repeatedly and routinely<sup>29</sup>.

**3. Depression:** By Beck Depression questionnaire that can be used to investigate depression statues. It contains 21 questions that measured sadness, pessimism, dissatisfaction, decision disorder, self-hatred and isolation. Minimum score is 0 and maximum score is 63.

**4. Anxiety:** Through Hamilton Anxiety questionnaire. Currently this test is the most famous test to evaluate degree of anxiety. It contains spread range of symptoms which usually diagnosed as an anxious state. It includes 14 questions about anxious mood, stress, insomnia, concentration disorder, muscular stress, public health,

cardiac signs, respiratory signs and behavior during interview. Also in researching about validity and stability of this scale, it was reported that questionnaire's correlation with beck questionnaire is 0.6, with -90 SCL is 0.73 and with clinical evaluation is 0.77.

**5. Quality of life:** Through SF 36 questionnaire that has 36 questions about quality of life. The aim of this test is examination of bodily and mental condition that evaluate individual's health in 8 fields; Public health, bodily function, limitation because of bodily reasons, limitation because of affection reasons, pain, social function, fatigue or freshness, mental health<sup>30</sup>.

**Statistical analysis**

After completing demographic, MMSE, Beck depression, Hamilton anxiety and SF36 questionnaires and gathering data from these questionnaires, first data were entered in the computer. Statistical analyses of this study were performed through statistical software of spss<sub>18</sub> and were analyzed through descriptive statistical test and coefficient of Pearson, regression, t-test and partial and bilateral ANOVA.

**RESULTS**

In this part by using MMSE, beck, Hamilton and SF36 questionnaires, comparative assessment of cognitive impairment, depression, anxiety and quality of life among brain tumor patients before and after surgery with healthy adults was done.

In this study there are 2 groups which contain healthy adults and patient with brain tumor before and after surgery. At first by using independent t-test, all there groups were examined and the mean and standard error difference of each variables were demonstrated. The sample was made up of 84 patient with brain tumor (50% men and 50% women, mean age=46.34±3.4) with 84 healthy adults in different age, sex, education level and marital status. Most of them are married (69.04%). Other demographic details are listed in table 1.

According to table 2, considering of comparative assessment of cognitive condition in term of MMSE questionnaire with equal variance, there is a meaningful difference (P<0.05) among patients with brain tumor before and after surgery and cognitive disorders was increased in patients after surgery. Also Beck depression

**Table 1.** Age and education in detail.

variable	Age groups	Patient		Healthy adult	
		N	percent	N	percent
Age	15-24	14	50%	14	50%
	25-34	20	50%	20	50%
	35-44	8	50%	8	50%
	45-54	26	50%	26	50%
	55-65	16	50%	16	50%
Education	Illiterate	52	61.9%	17	20.2%
	Diploma	20	23.8%	22	26.1%
	Upper diploma	12	14.2%	57	67.8%

**Table 2.** Comparative assessment of cognitive impairment, depression, anxiety and quality of life in brain tumor patient before and 10 days after surgery

Type of assessment of questionnaire	Type of patient	Mean±SD	P value
Rank MMSE questionnaire	Before surgery	22.24±6.71	<0.0001
	After surgery	10.00±0	
	Before surgery	22.24±6.71	<0.0001
	After surgery	10.00±0	
Rank Beck questionnaire	Before surgery	1.69±0.81	<0.0001
	After surgery	3.00±0	
	Before surgery	1.69±0.81	<0.0001
	After surgery	3.00±0	
Rank Hamilton questionnaire	Before surgery	2.24±0.65	<0.0001
	After surgery	3.00±0	
	Before surgery	2.24±0.65	<0.0001
	After surgery	3.00±0	
Rank SF36 questionnaire	Before surgery	1.98±0.64	0.30
	After surgery	1.81±0.83	
	Before surgery	1.98±0.64	0.30
	After surgery	1.81±0.83	

score in patients before surgery (mean: -1.31, SD: 0.12, 95% CI: -1.55, -1.06) and after surgery with (mean: -1.31, SD: 0.12, 95% CI: -1.56,-1.05). Beck depression score difference in patients before and after surgery was significant ( $p<0.0001$ ). Depression in patients after surgery is increased. Results in this table show that there are a meaningful difference in anxiety before surgery (mean: -0.76, SD: 0.10, 95% CI: -0.96, -0.56) and after surgery (mean: -0.76, SD: 0.10, 95% CI: -0.96, -0.55). That means, the increase in the level of anxiety was significant and their quality of life before and after surgery wasn't significant ( $p=0.30$ ).

Table 3 shows meaningful difference in cognitive impairment, depression, anxiety and quality of life between patients before and after surgery with healthy adults.

### DISCUSSION

The present study assessed cognitive impairment,

depression, anxiety and quality of life among the patients affected by brain tumor and healthy adults. Cognitive impairment, depression and anxiety were significantly correlated with each other and explained 62% of the variance in functional status<sup>15,16</sup> and also they related to quality of life<sup>20</sup>. This study demonstrated that patients suffer cognitive impairment when compared to healthy adults and it increased in patients after surgery. Cognitive function has been correlated to increased depression and anxiety in patients measured by the MMSE questionnaire.

According to this study, depression in patients with brain tumor is common. The finding showed depression can have a significant negative impact on quality of life<sup>14</sup>. As in the patients described in this study, depression increased in patients after surgery. Based on the perceived depression scale, mean levels of depression were significantly higher for patients after surgery than before surgery. Some previous studies also concluded that

**Table 3.** Comparative assessment of cognitive impairment, depression, anxiety and quality of life in brain tumor patient before and after surgery with healthy adults according equal variance assumed and not assumed

Type of assessment of questionnaire	Type of subjects	Mean±SD	P value
MMSE questionnaire	Before surgery	22.24±6.71	<0.0001
	Healthy adults	29.94±0.54	
	Before surgery	22.24±6.71	<0.0001
	Health	29.94±0.54	
	After surgery	10.00±0	<0.0001
	Health	29.94±0.54	
	After surgery	10.00±0	<0.0001
	Health	29.94±0.54	
	Rank Beck questionnaire	Before surgery	24.07±14.53
Health		20.36±2.30	
Before surgery		24.07±14.53	<0.0001
Health		20.36±2.30	
After surgery		50.00±0	<0.0001
Health		20.36±2.30	
After surgery		50.00±0	<0.0001
Health		20.36±2.30	
Rank Hamilton questionnaire		Before surgery	32.67±11.90
	Health	12.04±2.97	
	Before surgery	32.67±11.90	<0.0001
	Health	12.04±2.97	
	After surgery	48.57±3.17	<0.0001
	Health	12.04±2.97	
	After surgery	48.57±3.17	<0.0001
	Health	12.04±2.97	
	Rank SF36 questionnaire	Before surgery	58.55±26.78
Health		98.10±12.27	
Before surgery		58.55±26.78	<0.0001
Health		98.10±12.27	
After surgery		58.55±26.78	<0.0001
Health		98.10±12.27	
After surgery		58.55±26.78	<0.0001
Health		98.10±12.27	

symptoms of depression were common complication after surgery for brain tumor, and they increased throughout the 6 month period after surgery<sup>31</sup>.

Previous studies demonstrated that surgical resection of brain tumors may be associated with postoperative worsening of mood states and depression<sup>32</sup>. Comparison of the patients before and after surgery with healthy adults was showed that symptoms of anxiety increased postoperative. Studies on anxiety disorders in brain tumor patients have reported varying results<sup>33-35</sup>. Another study showed that patients with a right-hemisphere brain tumor had statistically significantly higher mean anxiety scores, which improved after surgical resection<sup>16</sup>.

Based on this study quality of life in patients before and after surgery does not have a significant difference. This result is not in line with some previous studies that indicate quality of life deteriorate after surgery<sup>14</sup>. Future studies should justify changes of nerve system that have a roll to increasing cognitive impairment, depression and anxiety in patients after surgery. In addition evaluating of quality of life should assess in longer period after surgery. Now we need to novel techniques for assessing and rehabbing of these impairments because these methods help to better quality of life<sup>36-40</sup>.

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#### COMPETING INTERESTS

None declared.

#### REFERENCES

1. Wrench M, Minn Y, Chew T. Epidemiology of primary brain tumors: current concepts and review of the literature. *Neuro Oncol.* 2002;4:278–99.
2. Denham SA, Brown CA, Domitrovich CE. “Plays nice with others”: Social-emotional learning and academic success. In special issue, H. Teglasi (Ed.), *Overlaps between socio-emotional and academic development, Early Education and Development.* 2010;21:652–680.
3. Osoba D, Brada M, Prados MD, Yung WK. Effect of disease burden on health-related quality of life in patients with malignant gliomas. *Neuro-Oncology.* 2000;2:221–228.
4. Mainio A, Hakko H, Niemela A, Tuurinkoski T, Koivukangas J, Rasanen P. The effect of brain tumour laterality on anxiety levels among neurosurgical patients. *J Neurol Neurosurg Psychiatry.* 2003;74:1278–1282.
5. Cummings JL. Neuropsychiatric manifestations of right hemisphere lesions. *Brain Lang.* 1997;57:22–37
6. Taphoorn MJ, Schiphorst AK, Snoek FJ, Lindeboom J, Wolbers JG, Karim AB, et al. Cognitive functions and quality of life in patients with low-grade gliomas: the impact of radiotherapy. *Ann Neurol.* 1994;36:48–54.
7. Gustafsson M, Edvardsson T, Ahlstrom G. The relationship between function, quality of life and coping in patients with low-grade gliomas. *Support Care Cancer.* 2006;14:1205–1212.
8. Bhat SR1, Goodwin TL, Burwinkle TM, Lansdale MF, Dahl GV, Huhn SL, et al. Profile of daily life in children with brain tumors: An assessment of health-related quality of life. *J Clin Oncol.* 2005;23:5493–5500,
9. Weitzner MA1, Meyers CA, Gelke CK, Byrne KS, Cella DF, Levin VA. The Functional Assessment of Cancer Therapy (FACT) scale. Development of a brain subscale and revalidation of the general version (FACT-G) in patients with primary brain tumors. *Cancer.* 1995;75:1151–1161.
10. Wen PY, Kesari S. Malignant gliomas in adults. *N Engl J Med.* 2008 Jul 31;359(5):492–507.
11. Meyers CA, Hess KR, Yung WK, Levin VA. Cognitive functions as a predictor of survival in patients with recurrent malignant glioma. *J Clin Oncol.* 2000;18:646–650
12. Giovagnoli AR, Silvani A, Colombo E, Boiardi A. Facets and determinants of quality of life in patients with recurrent high grade glioma. *J Neurol Neurosurg Psychiatry.* 2005;76:562–568.
13. Meyers CA, Hess KR. Multifaceted end points in brain tumor clinical trials: cognitive deterioration precedes MRI progression. *Neuro- Oncology.* 2003;5:89–95
14. Klein M1, Postma TJ, Taphoorn MJ, Aaronson NK, Vandertop WP, Muller M, et al. The prognostic value of cognitive functioning in the survival of patients with high-grade glioma. *Neurology.* 2003;61:1796–1798.
15. Fox S, Lyon D, Farace E. Symptom clusters in patients with high – grade glioma. *Journal of Clinical Scholarship.* 2007;39(1):61– 67.
16. Litofsky N, Farace E, Anderson F, Meyers C, Huang W, Laws E. Depression in patients with high-grade glioma: results of the glioma outcomes project. *Neurosurgery.* 2004;54:358–367.
17. Mainio A, Tuunanen S, Hakko H, Niemela A, Koivukangas J, Rasanen P. Decreased quality of life and depression as predictors for shorter survival among patients with low-grade gliomas: a follow-up from 1990 to 2003. *Eur Arch Psychiatry Clin Neurosci.* 2006;256:516–21.
18. Mainio A, Hakko H, Timonen M, Niemela A, Koivukangas J, Rasanen P. Depression in relation to survival among neurosurgical patients with a primary brain tumor: a 5-year follow-up study. *Neurosurgery* 2005;56:1234–41.
19. North CA, North RB, Epstein JA, Piantadosi S, Wharam MD. Low grade cerebral astrocytomas. Survival and quality of life after radiation therapy. *Cancer.* 1990;66:6–14.



20. Pelletier G, Verhoef MJ, Khatri N, Hagen N. Quality of life in brain tumor patients: the relative contributions of depression, fatigue, emotional distress, and existential issues. *J Neurooncol.* 2002;57:41–49.
21. Van Den Bent MJ, Afra D, De Witte O. Long-term efficacy of early versus delayed radiotherapy for low-grade astrocytoma and oligodendroglioma in adults: the EORTC 22845 randomised trial. *Lancet.* 2005;366:985–90.
22. Armstrong T, Cohen MZ, Hess KR. Complementary and alternative medicine use and quality of life in patients with primary brain tumors. *J Pain Symptom Manage.* 2006;32:148–154.
23. Kaleita TA, Wellisch DK, Graham CA, Steh P, Nghiemphu JM, Ford A, et al. Pilot study of modafinil for treatment of neurobehavioral dysfunction and fatigue in adult patients with brain tumors. *J Clin Oncol.* 2006;24:1503.
24. Walker M, Brown J, Brown K, Gregor A, Whittle IR, Grant R. Practical problems with the collection and interpretation of serial quality of life assessments in patients with malignant glioma. *J Neurooncol.* 2003;63:179–186.
25. Mainio A, Hakko H, Niemela A. Gender difference in relation to depression and quality of life among patients with a primary brain tumour. *European Psychiatry: the journal of the Association of European Psychiatrists.* 2006;21(3):194–9.
26. Brown PD, Maurer MJ, Rummans TA. A prospective study of quality of life in adults with newly diagnosed high-grade gliomas: the impact of the extent of resection on quality of life and survival. *Neurosurgery.* 2005;57:495–504.
27. Jenkins CA, Bruera E. Difficulties in diagnosing neuropsychiatric complications of corticosteroids in advanced cancer patients: two case reports. *J Pain Symptom Manage.* 2000;19:309–317.
28. Armstrong TS, Cohen MZ, Eriksen LR, Hickey JV. Symptom clusters in oncology patients and implications for symptom research in people with primary brain tumors. *J Nurs Sch.* 2004;36:197–206.
29. Folstein M, Folstein SE, McHugh PR. “Mini-Mental State” a Practical Method for Grading the Cognitive State of Patients for the Clinician. *Journal of Psychiatric Research.* 1975;12(3);189-198.
30. Orley J. WHO meeting on quality of life: development of the WHOQOL instrument. *quality of life news;* 1992.
31. Sheline GE, Warra W, Smith V. Therapeutic irradiation and brain injury. *International Journal of Radiation Oncology and Biological Physics.* 1980;6:1215–1228.
32. Irle E, Peper M, Wowra B, Kunze S. Mood changes after surgery for tumors of the cerebral cortex. *Arch Neurol.* 1994; 51:164–174.
33. Giovagnoli AR, Tamburini M, Boiardi A. Quality of life in brain tumor patients. *J Neurooncol.* 1996;30:71–80.
34. Kaplan, CP. Miner, ME. Relationships: importance for patients with cerebral tumours. *Brain Inj.* 2000;14:251–259.
35. Arnold, SD. Forman, LM. Brigidi, BD. Evaluation and characterization of generalized anxiety and depression in patients with primary brain tumors. *Neuro-Oncology.* 2008;10:171–181.
36. Zarghi A, Zali A, Ashrafi F, Moazezi M. Neuroscience and Neuro-cognitive Rehabilitation. *Basic Research Journal of Medicine and Clinical Sciences.* 2013a;2(8),83-87.
37. Zarghi A, Zali A, Ashrafi F, Moazezi M. Emotional, behavioral and cognitive mechanisms in rehabilitation of romantic love neuro-cognitive process. *Basic Research Journal of Medicine and Clinical Sciences.* 2013b; (9):94-102.
38. Zarghi A, Zali A, Tehranidost M, Zarindast MR, Ashrafi F, Khodadadi M. Comparative assessment of neuro-cognitive impairments among patients with brain tumor and healthy adults. *Turkish Neurosurgery.* 2012a;22:309-316.
39. Zarghi A, Zali A, Tehranidost M, Ashrafi F, Zarindast M.R, Moazezi M, et al. Assessment of Selective Attention With CSCWT (Computerized Stroop Color-Word Test) Among Children and Adults, *US-China Education Review A.* 2012b;1:121-127.
40. Zarghi A, Zali A, Tehranidost M, Zarindast MR, Ashrafi F, Doroodgar S, et al. The Relationship between Age, Sex and Education Variables with Selective, Sustained Attention and Planning through Cognitive Tasks among Healthy Adults. *Basic and Clinical Neuroscience.* 2011;2(3):58-67.