

## Research Paper:

# Three-year Survival Rate in All Kinds of Glioma Tumors in one Institution, Iran, 2001-2010



Masih Rezaee<sup>1\*</sup>, Bahram Amin-Mansour<sup>2</sup>

1. Division of Pulmonary, Allergy and Sleep Medicine, Department of Internal Medicine, Mayo Clinic, Jacksonville, Florida, Unites States
2. Department of Neurosurgery, Al-Zahra Hospital, Isfahan University of Medical Sciences, Isfahan, Iran



**Citation:** Rezaee M, Amin-Mansour B. Three-year Survival Rate in All Kinds of Glioma Tumors in one Institution, Iran, 2001-2010. Iran J Neurosurg. 2020; 6(2):67-72. <http://dx.doi.org/10.32598/irjns.6.2.3>

**doi:** <http://dx.doi.org/10.32598/irjns.6.2.3>



### Article info:

**Received:** 22 Nov 2019  
**Accepted:** 10 Feb 2020  
**Available Online:** 01 Apr 2020

### Keywords:

Three-year survival rate,  
High-grade glioma, Low-grade glioma, Iran

## ABSTRACT

**Background and Aim:** The survival rate of brain tumors has not yet been reported in Iran. The purpose of this study, given the lack of such information, was to evaluate the 3-year survival rate in patients with all kinds of glioma tumors.

**Methods and Materials/Patients:** This study was descriptive and retrospective, including 222 patients who had been diagnosed clinically with one type of glioma tumor and admitted to Al-Zahra hospital, Isfahan, Iran during 2001-2010. All patients (for minors, their parents) were contacted by phone. They were asked about the 3-year survival rate following their tumor resection surgery. Data such as patient's age on admission, gender, histological diagnosis of tumor, and treatment regimen (surgical/non-surgical, radiation, and/or chemotherapy) were collected from medical records. The 3-year survival rate and frequency of each tumor based on age and gender were measured.

**Results:** The 3-year survival rates for Glioblastoma Multiform (GBM) and anaplastic astrocytoma were 8.7% and 0%, respectively following surgery and chemo-radiation. These tumors were categorized as high-grade glioma with poor prognosis. The 3-year survival rate for diffuse astrocytoma, low-grade oligodendroglioma, low-grade ependymoma, and pilocytic astrocytoma following surgery and radiation were 100%, 95.2%, 100%, and 100%, respectively. These tumors were categorized as low-grade glioma, which has a good prognosis.

**Conclusion:** In this study, the 3-year survival rate in patients with low-grade glioma following surgery and radiation was almost 100%. In contrast, the 3-year survival rate in patients with high-grade glioma following surgery and chemo-radiation was almost 0%.

### \* Corresponding Author:

**Masih Rezaee, MD.**

**Address:** Division of Pulmonary, Allergy and Sleep Medicine, Department of Internal Medicine, Mayo Clinic, Jacksonville, Florida, Unites States

**Tel:** +1 (202) 8734021

**E-mail:** [masih.rezaee2009@gmail.com](mailto:masih.rezaee2009@gmail.com)



## Highlights

- Following surgery and radiation, the 3-year survival rate for diffuse astrocytoma, low-grade oligodendroglioma, low-grade ependymoma, and pilocytic astrocytoma were 100%, 95.2%, 100%, and 100%, respectively.
- Following surgery and chemo-radiation, the 3-year survival rate for glioblastoma multiform and anaplastic astrocytoma were 8.7% and 0%, respectively.
- Diffuse astrocytoma, low-grade oligodendroglioma, low-grade ependymoma, and pilocytic astrocytoma were considered low-grade glioma in this study. Glioblastoma multiform and anaplastic astrocytoma were considered high-grade glioma.

## Plain Language Summary

Due to the lack of survival studies about glioma tumors in Iran, we performed this study at Al-Zahra hospital, Isfahan. We identified all patients who had been admitted to the department of neurosurgery with a diagnosis of glioma tumor during 2001-2010. We contacted the patients, explained the structure and goal of the study, and then obtained consent from them. They were asked about the 3-year survival rate after tumor resection surgery. Also, patients' medical records were obtained. Information on age, gender, histologic diagnosis of the tumor, treatment regimen, and 3-year survival rate were collected into Microsoft Excel to draw plots. SPSS software V. 23 was used to measure mean, median, mode, and standard deviation for each age group. We set the desired age for pilocytic astrocytoma and ependymoma at 10 years old, and for the rest of the tumors at 50 years old. We measured the distribution of each tumor among men and women and different age groups. We concluded that the 3-year survival rate for low-grade glioma (diffuse astrocytoma, low-grade oligodendroglioma, low-grade ependymoma, and pilocytic astrocytoma) following surgery and radiation was 100% except for low-grade oligodendroglioma in which it was 95.2%. In contrast, the 3-year survival rate for high-grade glioma (glioblastoma multiform and anaplastic astrocytoma) following surgery and chemo-radiation was 0% for anaplastic astrocytoma and 8.7% for Glioblastoma Multiform (GBM).

### 1. Introduction

**T**he survival rate in the brain tumor is an important indicator in the patient's health care. Not only does it depict the biology and nature of the tumor, but it can also be used to predict the quality of care that the patient receives. The survival rate in brain tumors has not yet been reported in Iran. Thus, the purpose of this study was to evaluate the 3-year survival rate in patients with all kinds of glioma tumors who had been admitted to one of the university hospitals of Isfahan from 2001-2010. Diagnosis of glioma tumor had been made clinically at the time of admission. Glioma is a type of brain tumor that can form in the brain or spinal cord. This type of tumor originates from glial cells [1, 2]. Glioma is categorized as low-grade or high-grade (anaplastic or malignant).

### 2. Methods and Materials/Patients

This study was retrospective and descriptive. The target population was patients who had been diagnosed

clinically with one type of glioma tumor and then admitted to Al-Zahra hospital. A list of 490 patients was prepared. All patients (for minors, their parents) were contacted, and the structure and objective of the study were explained to them. After giving consent to participate in the study (according to regulations of Ethics Committee and Deceleration of Helsinki), they were asked about the 3-year survival after tumor resection surgery. Also, patients' medical records were used to collect information such as age at the time of admission, gender, histologic diagnosis of tumor, and treatment regimen (surgical/non-surgical, radiation, and/or chemotherapy).

Patients without proper contact information, patients expired during hospitalization for tumor resection, patients without tumor resection surgery, or those unwilling to participate in the study were excluded. Also, patients with histopathologic tumors other than glioma were not considered.

**Table 1.** Frequency of Each Tumor in the Study Population, Al-Zahra Hospital, Isfahan

Tumor Type	Number of Patients	%		Age Group	Mean±SD	Median
		Male	Female			
GBM	161	60.8	39.2	(45,81)	64.71±9.39	66
Diffuse astrocytoma	36	63.8	36.2	(37,56)	45.13±5.45	44
Oligodendroglioma	9	55.6	44.4	(31,52)	42.4±5.4	41.7
Ependymoma	7	42	58	(9,16)	11.42±2.37	12
Pilocytic astrocytoma	5	80	20	(5,11)	8.6±3.04	9
Anaplastic astrocytoma	4	75	25	(28,44)	35.8±6.68	35



Given the above exclusion criteria, 222 out of 490 patients were enrolled in the study. Moreover, 83.7% of patients were male, and 16.3% of patients were female.

All the information was collected into Microsoft Excel 2013 (Microsoft Corporation, Albuquerque, NM, USA) to draw plots. SPSS V. 23.0 (SPSS Inc. Chicago, IL) was used to measure Mean, median, and Standard Deviation (SD) for each age group.

In this study, all patients with oligodendroglioma and ependymoma were classified as grade II pathologically and considered low-grade. Patients with glioblastoma multiform and anaplastic astrocytoma were categorized as high-grade glioma.

### 3. Results

The target population consisted of 136 male and 86 female patients (Table 1). The frequency of each type of glioma tumor and the 3-year survival rate for each are shown in Figures 1 and 2.

In the diffuse astrocytoma group, 63.8% of patients were male, and 36.2% were female. Furthermore, 16.6% were over the age of 50 years, and 83.2% were under the age of 50 years. All patients with this tumor received surgery and radiation. The 3-year survival rate was 100%.

In the low-grade oligodendroglioma group, 55.6% of patients were male, and 44.4% were female. Of all patients, 11.2% were over the age of 50 years, and 88.8% were under the age of 50 years. All patients with this tumor underwent surgery and radiation. The 3-year survival rate was 95.2%. In the low-grade ependymoma group, 42% of patients were male, and 58% were fe-

male. Moreover, 14.2% were over the age of 10 years, and 85.8% were under the age of 10 years. All patients with this tumor received surgery and radiation. The 3-year survival rate was 100%.

In the pilocytic astrocytoma group, 80% of patients were male, and 20% were female; 20% percent were over the age of 10 years, and 80% were under the age of 10 years. All patients with this tumor received surgery and radiation. The 3-year survival rate was 100%.

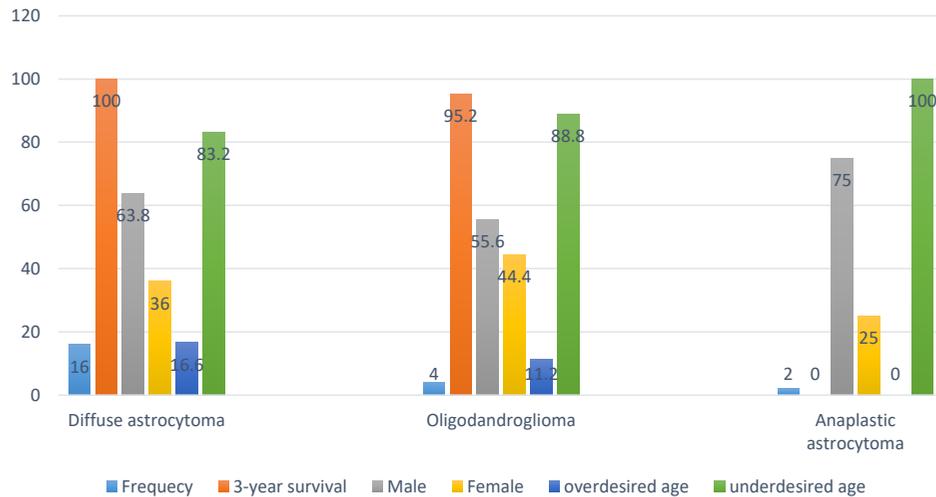
In the GBM group, 60.8% of patients were male, and 39.1% were female. Furthermore, 50.3% were over the age of 50 years, and 49.7% were under the age of 50 years. All patients with this tumor received surgery and chemo-radiation. The 3-year survival rate was 8.7%.

In the anaplastic astrocytoma group, 75% of patients were male, and 25% were female; 100% percent of the patients were under the age of 50 years. All patients with this tumor received surgery and chemo-radiation. The 3-year survival rate was 0%.

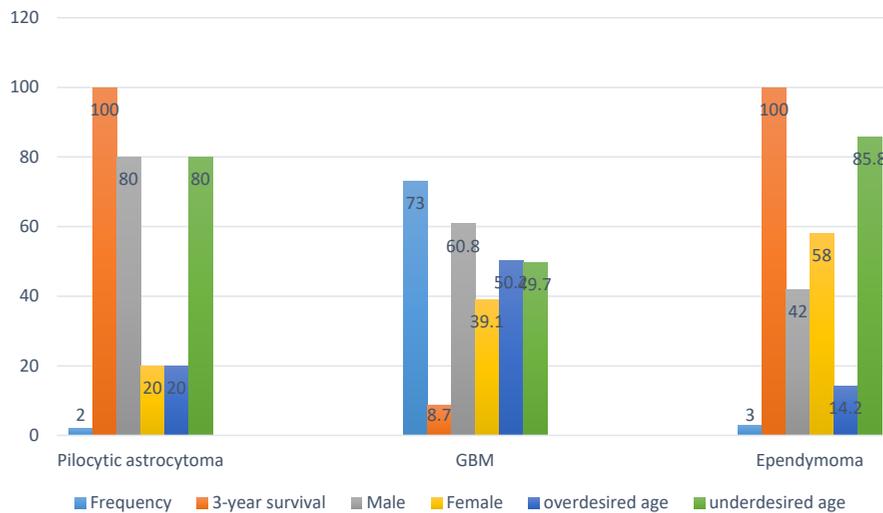
### 4. Discussion

Low-grade glioma is less aggressive than high-grade glioma, and surgery is the most effective treatment for this type of tumor [3, 4]. On the other hand, high-grade glioma can behave aggressively at old age; if so, affected patients demand more aggressive treatment followed by adjuvant treatment [5].

Maiuri et al. (2006) found that oligodendroglioma is biologically unpredictable and concluded that the result of treatment and survival rate of this tumor depends on the age and sex of the patient [6]. Ohgaki et al. (2005)



**Figure 1.** Three-year survival percentage for each tumor, and frequency percentage for each tumor, age, and gender



**Figure 2.** Three-year survival percentage for each tumor, and frequency percentage for each tumor, age, and gender



found that the average survival rate was 11.6 years for patients with grade III oligodendroglioma, 6.5 years for patients with grade III oligodendroglioma. Also, they found that the average survival rate of patients with diffuse astrocytoma was 5.6 years [7]. Pilocytic astrocytoma and ependymoma often develop during childhood. Andrychowski et al. (2009) found that pilocytic astrocytoma is a histologic benign tumor that allows for long-time survival [8]. Fisher et al. (2008) suggested that immediate post-operative radiation does not confer an advantage in delaying the first progression in childhood with residual pilocytic astrocytoma [9]. Ohgaki et al. (2005) reported that the 10-year survival rate in pilocytic astrocytoma was 96% [7]. In their study, Kukreja et al. (2014) proposed that the 5-year survival rate for 95 patients with spinal ependymoma, treated with surgical

resection and radiation, was 98.8% [10]. For high-grade glioma and malignant astrocytoma, the survival rate was very disappointing despite improvements in surgical and radiation techniques.

Pavlicevic et al. (2003) concluded that the outcome after the operative treatment of malignant astrocytoma depends significantly on the patient’s age and the extent of the tumor [11]. In the study on 390 patients with anaplastic glioma and anaplastic astrocytoma, Mukherjee et al. (2014) found that the median survival rate in patients with gross total resection and radiotherapy was 11 months [12]. According to Graus et al. (2013), in GBM patients after surgical resection of the tumor, initiation of radiotherapy  $\leq 42$  days was associated with better progression-free survival [13].

Stupp et al. (2009) found that the 3-year survival rate in patients with newly diagnosed GBM who were treated with radiation and adjuvant temozolomide therapy was 16% [14].

Location of the tumor, the extent of tumor resection, and associated symptoms were among important variables that had been used by the clinical team to utilize chemotherapy/radiation or a combination of both post-operatively. These variables should have been evaluated in this study, but due to incomplete documentation of patients' medical records and follow-up, the authors were not able to consider all of these variables and only reported what they found through medical records and interviewing patients. Further research with larger sample size is needed to consider all of these variables and determine the survival rates of all kinds of glioma tumors. Moreover, the authors recommend using an electronic medical record system and brain tumor registry in the Iranian health care system like the ones that are being used in the United States (CPRS, Epic, etc.) to facilitate access of researchers to all of the necessary information of the patients and consequently improve overall patient's care.

## 5. Conclusion

The results of this study indicated that in low-grade glioma, surgery with radiotherapy increased the 3-year survival rate. In contrast, for high-grade glioma, surgery and chemo-radiation did not improve the 3-year survival rate.

### Ethical Considerations

#### Compliance with ethical guidelines

The study was reviewed and approved by the institutional review board of Isfahan University of Medical Sciences (Ethical Code: IR.MUI.REC.1394.9.307).

#### Funding

This study was funded by the Vice-Chancellor for Research and Technology at Isfahan University of Medical Sciences, Iran.

#### Authors' contributions

Both authors equally contributed to preparing this article.

#### Conflict of interest

The authors declared no conflict of interest.

### Acknowledgements

The authors would like to thank Dr. Mohammad Reza Maracy in Department of Epidemiology, Isfahan University of Medical Sciences, Iran who assisted us in designing this study. We also would like to express our gratitude to the chairman of Al-Zahra Hospital, Dr. Majid Rezvani, as well as the staff in the Department of Archive Medical Records, who facilitated our access to the patients' medical records.

### References

- [1] Mamelak AN, Jacoby DB. Targeted delivery of antitumoral therapy to glioma and other malignancies with synthetic chlorotoxin (TM-601). *Expert Opinion on Drug Delivery*. 2007; 4(2): 175-86. [DOI:10.1517/17425247.4.2.175] [PMID]
- [2] Goodenberger ML, Jenkins RB. Genetics of adult glioma. *Cancer Genetics*. 2012; 205(12):613-21. [DOI:10.1016/j.cancer-gen.2012.10.009] [PMID]
- [3] Bauman G, Fisher B, Watling C, Cairncross JG, Macdonald D. Adult supratentorial low-grade glioma: Long-term experience at a single institution. *International Journal of Radiation Oncology, Biology, Physics*. 2009; 75(5):1401-7. [DOI:10.1016/j.ijrobp.2009.01.010] [PMID]
- [4] Ahmadi R, Dictus C, Hartmann C, Zurn O, Edler L, Hartmann M, et al. Long-term outcome and survival of surgically treated supratentorial low-grade glioma in adult patients. *Acta Neurochir (Wien)* 2009; 151(11):1359-65. [DOI:10.1007/s00701-009-0473-4] [PMID]
- [5] Schomas DA, Laack NN, Brown PD. Low-grade gliomas in older patients: Long-term follow-up from Mayo Clinic. *Cancer*. 2009; 115(17):3969-78. [DOI:10.1002/cncr.24444] [PMID] [PMCID]
- [6] Maiuri F, Del Basso De Caro ML, Iaconetta G, Peca C, Esposito M, de Divitiis E. Prognostic and survival related factors in patients with well-differentiated oligodendrogliomas. *Zentralblatt fur Neurochirurgie*. 2006; 67(4):204-9. [DOI:10.1055/s-2006-942138] [PMID]
- [7] Ohgaki H, Kleihues P. Population-based studies on incidence, survival rates, and genetic alterations in astrocytic and oligodendroglia gliomas. *Journal of Neuropathology & Experimental Neurology*. 2005; 64(6):479-89. [DOI:10.1093/jnen/64.6.479] [PMID]
- [8] Andrychowski J, Taraszewska A, Czernicki Z, Jurkiewicz J, Netczuk T, Dabrowski P. Ten years observation and treatment of multifocal pilocytic astrocytoma. *Folia Neuropathol* 2009; 47(4):362-70. [PMID]
- [9] Fisher PG, Tihan T, Goldthwaite PT, Wharam MD, Carson BS, Weingart JD, et al. Outcome analysis of childhood low-grade astrocytoma. *Pediatr Blood Cancer*. 2008; 51(2):245-50. [DOI:10.1002/pbc.21563] [PMID]
- [10] Kukreja S, Ambekar S, Sin AH, Nanda A. Cumulative survival analysis of patients with spinal myxopapillary ependymomas in

- the first 2 decades of life. *Journal of Neurosurgery Pediatrics*. 2014; 13(4): 400-7. [DOI:10.3171/2014.1.PEDS13532] [PMID]
- [11] Pavlicevic G, Roganovic Z. Outcome of surgical treatment of malignant astrocytoma of the brain. *Vojnosanit Pregl*. 2003; 60(2):147-54. [DOI:10.2298/VSP0302147P] [PMID]
- [12] Mukherjee D, Sarmiento JM, Nosova K, Boakye M, Lad SP, Black KL, et al. Effectiveness of radiotherapy for elderly patients with anaplastic gliomas. *Journal of Clinical Neuroscience*. 2014; 21(5):773-8. [DOI:10.1016/j.jocn.2013.09.004] [PMID]
- [13] Graus F, Bruna J, Pardo J, Escudero D, Vilas D, Barcelo I, et al. Patterns of care and outcome for patients with glioblastoma diagnosed during 2008-2010 in Spain. *Neuro-Oncology*. 2013; 15(6):797-805. [DOI:10.1093/neuonc/not013] [PMID] [PMCID]
- [14] Stupp R, Hegi ME, Mason WP, van den Bent MJ, Taphoorn MJ, Janzer RC, et al. Effects of radiotherapy with concomitant and adjuvant temozolomide versus radiotherapy alone on survival in glioblastoma in a randomized phase III study: 5-year analysis of the EORTC-NCIC trial. *The Lancet: Oncology*. 2009; 10(5):459-66. [DOI:10.1016/S1470-2045(09)70025-7] [PMID]