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Prevalence and Independent Risk Factors of Anxiety and Depression Symptoms in Glioma Patients: A Cross-Sectional Analysis

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ABSTRACT

Background: To investigate the current status of anxiety and depression symptoms in patients with brain glioma and identify the risk factors associated with anxiety and depression symptoms.

Methods: A total of 105 patients diagnosed with glioma at Longgang Central Hospital of Shenzhen from January 2021 to April 2024 were included in this study. The Hospital Anxiety and Depression Scale (HADS) was used to assess the anxiety and depression symptoms of the patients, who were then grouped based on their scores. Chi-square tests and binary logistic regression analyses were performed to identify the independent risk factors for anxiety and depression symptoms in glioma patients.

Results: The average HADS-Anxiety score among glioma patients was 8.72 ± 3.41, with an anxiety symptoms prevalence of 61.90% (65/105). The average HADS-Depression score was 7.73 ± 2.91, with a depression symptoms prevalence of 55.24% (58/105). Among them, 58 patients (55.24%) had both anxiety and depression symptoms, seven patients (6.67%) had only anxiety symptoms, and 40 patients (38.10%) had neither anxiety nor depression. The results of binary tic regression analysis showed that family monthly income, seizures, sleep quality, and cognitive function impairment were independent risk factors for anxiety and depression symptoms ($P < .05$). Marital status was an independent risk factor for depression symptoms ($P < .05$).

Conclusion: Glioma patients exhibit a high incidence of anxiety and depression symptoms. The occurrence of these conditions is significantly associated with lower monthly household income, seizure occurrence, sleep disturbances, and cognitive impairment.

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INTRODUCTION

Gliomas are the most common intracranial tumors in the central nervous system of adults. Among primary tumors, gliomas account for 80% of primary brain tumors.[1] Globally, approximately 100 000 individuals are diagnosed with gliomas each year.[2,3] Currently, surgery is the primary treatment modality for gliomas. However, 80% of gliomas are classified as grade III-IV malignant gliomas. Due to their diffuse infiltrative growth, lack of encapsulation, and absence of clear boundaries with surrounding brain tissue, these tumors can migrate along brain structures, making effective resection challenging.[4] Postoperative patients often require further radiotherapy and chemotherapy, which are painful. Additionally, the pressure, infiltration, and invasion of the tumor on surrounding brain tissue, combined with the patients' fear of the disease, lead to a significant number of cases of anxiety and depression among glioma patients.[5-8] Reportedly, the incidence of anxiety and depression in glioma patients is 70.4% and 53.5%, respectively.[9,10] Depression not only exacerbates the discomfort symptoms of glioma patients and affects their quality of life (QoL) but also promotes tumor progression, leading to a poor prognosis.[11-13] Fu et al[14] and colleagues found that glioma patients with higher anxiety and depression scores after brain surgery by the same group of doctors had higher mortality rates. Magnetic resonance imaging revealed that patients with severe depression had more severe peritumoral edema and a higher proportion of tumor necrosis, and patients with higher anxiety scores also had a higher degree of tumor necrosis. Therefore, anxiety and depression in glioma patients are issues that require continuous attention, follow-up, and management.[15,16]

Identifying the factors that lead to anxiety and depression symptoms in glioma patients is a prerequisite for improving and enhancing their psychological state. Current research

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has identified some potential risk factors influencing anxiety and depression in glioma patients. For instance, Hao et al[17] indicated that factors such as gender, diabetes, marital status, and hyperlipidemia are associated with the occurrence of anxiety and depression, with high levels of anxiety and depression implying a decrease in overall survival. Li et al[18] found that depression in glioma patients is associated with elevated levels of interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α). Additionally, Wu et al[19] discovered that factors such as functional status scores and postoperative complications are risk factors for anxiety and depression in glioma patients. However, there is currently limited research on factors that may influence anxiety and depression in glioma patients, such as monthly household income, disease symptoms, and treatment side effects. This study aims to investigate the prevalence of anxiety and depression symptoms in patients with brain glioma, evaluating the impact of specific symptoms (such as tumor recurrence, seizures, headache, fatigue, and hair loss) and treatment side effects (such as poor sleep quality, loss of appetite, and diarrhea) on their anxiety and depression. Additionally, the study examines the relationship between these psychological conditions and patients' sociodemographic characteristics, including age, gender, education level, monthly household income, marital status, employment status, and residence.

MATERIAL AND METHODS

Subjects

The data used in this study were collected from primary glioma patients in Neurosurgery Department of Longgang Central Hospital of Shenzhen from January 2021 to April 2024. The study was approved by the Ethics Committee of Longgang Central Hospital of Shenzhen (Approval No.: 2023ECPJ103 Date: December 28, 2023). The inclusion criteria were as follows: (1) patients diagnosed with primary glioma; (2) patients aged 18-80 years; (3) patients who do not have severe mental disorders, as determined by a combination of interviewing the patients, consulting with their families, and reviewing their medical records; and (4) patients who were informed about the study and provided written consent to participate. The exclusion criteria were: (1) patients with a history of or concurrent other malignant tumors; (2) patients diagnosed with glioma for less than 6 months; (3) pregnant or lactating women; and (4) patients with incomplete data or questionnaires. Finally, 105 patients with primary glioma were included in this study (Figure 1).

Data Collection

General information about the patients was collected, including age, gender (male or female), education level (high school and below, college or above), and monthly household income [based on China's per capita income and the classification method in the study by Su et al,[20] monthly household income is divided into an upper-middle income level (≥5000 CNY) and a lower-middle income level (<5000 CNY)], marital status (unmarried, married, get divorced or widowed spouse), employment status (unemployment or on the job), and place of residence (rural, towns or cities). Clinical information gathered included tumor recurrence (yes or no), seizures in the past 3 months (yes or no),

MAIN POINTS

- **Prevalence of Anxiety and Depression Symptoms**: The study highlights a high prevalence of anxiety symptoms (61.90%) and depression symptoms (55.24%) among glioma patients, with significant proportions experiencing moderate to severe levels of these conditions.
- **Risk Factors Identified**: The research identifies key independent risk factors for anxiety and depression symptoms in glioma patients, including low monthly household income, seizure occurrence, poor sleep quality, and cognitive impairment.
- **Impact on Quality of Life (QoL)**: Anxiety and depression symptoms are shown to significantly affect the QoL of glioma patients, exacerbating discomfort and potentially contributing to a poor prognosis.
- **Clinical Implications**: The findings suggest that addressing these psychological conditions and their associated risk factors is crucial in the management and treatment of glioma patients to improve their overall well-being and clinical outcomes.
- **Study Limitations**: The study acknowledges limitations, such as being a single-center study with a relatively small sample size, and the need for further research with more detailed variable stratification and comparison across different stages of disease and treatment.

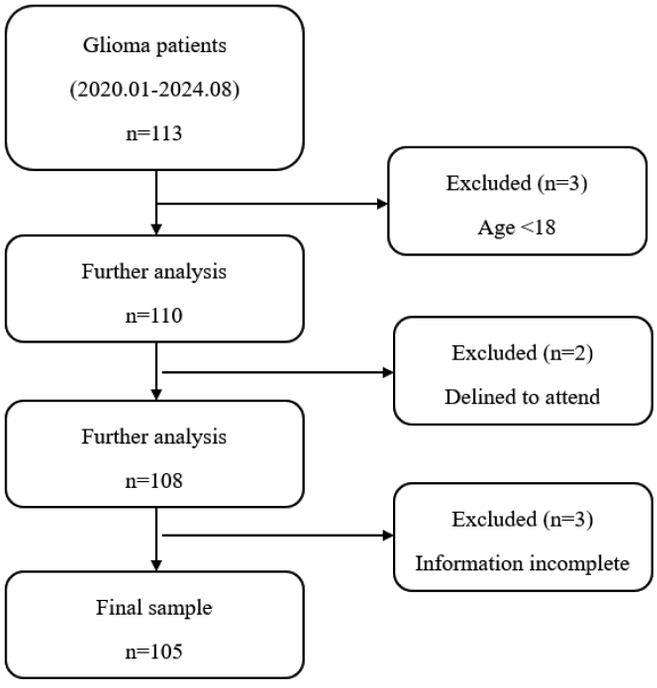

Figure 1. Study participants' flowchart.

headaches (no, sometimes or often), fatigue (no, slight or serious), hair loss (yes or no), sleep quality (normal, worse off or very bad), appetite (no, slight or serious), number of diarrhea episodes in the last month, and the Mini-Mental State Examination (MMSE) scores (A score ≥24 indicates no cognitive impairment, while a score <24 indicates cognitive impairment).[10] The study employed a one-on-one, face-to-face approach, ensuring that patients fully understood the information and questionnaire before they or the investigators filled out the questionnaire. The severity of symptoms such as headache, hair loss, fatigue, sleep, and appetite was determined through patient self-assessment. Three response options—"normal," "poor," and "very poor"—were provided to allow patients to evaluate their symptom status based on their personal experience. The MMSE assessment was conducted by professionally trained neurologists during the patients' initial visit. Each patient's evaluation was carried out in a controlled environment to ensure the consistency and accuracy of the assessment.

Hospital Anxiety and Depression Scale Assessment and Grouping

The Hospital Anxiety and Depression Scale (HADS) was used to evaluate the symptoms of anxiety and depression in glioma patients. The HADS is a widely used and reliable self-assessment scale in clinical settings.[21] The scale consists of 14 items, with 7 items measuring anxiety (HADS-A) and 7 items measuring depression (HADS-D). Each item is scored from 0 to 3, with higher scores indicating more severe anxiety and depression. The severity of anxiety and depression symptoms was categorized as follows: 0-7 = normal, 8-10 = mild, 11-14 = moderate, and 15-21 = severe. The assessment was conducted face-to-face, with investigators assisting patients in understanding the questionnaire content. Patients then completed the questionnaire independently, with assistance provided by investigators when necessary. Patients with HADS-A and HADS-D scores >7 were classified into the anxiety and depression symptoms group, while those with scores ≤7 were classified into the non-anxiety and non-depression group.

Statistical Analysis

Statistical analysis was performed using SPSS 26.0 (IBM SPSS Corp.; Armonk, NY, USA) software. GraphPad Prism 9.0 was used for creating graphical representations. Continuous variables with normal distribution were represented by "mean ± SD", and independent sample *t*-test was used for comparison between groups. The non-normal distribution was represented by M50 (Q25, Q75), and the comparison between groups was performed by a non-parametric test. Categorical variables are expressed as "n (%)", and Chi-square tests or Fisher exact tests were used for comparison between groups. Binary logistic regression was employed to identify independent risk factors for anxiety and depression. A *P*-value of less than .05 was considered statistically significant.

RESULTS

Patient Characteristics

The average age of the enrolled patients was 53.77 ± 11.82 years, and the average MMSE score was 25.14 ± 4.61. Other basic demographic and clinical characteristics are summarized in Table 1.

Anxiety and Depression Assessment

The average HADS-A score among glioma patients participating in this study was 8.72 ± 3.41, with an anxiety symptoms prevalence of 61.90% (65/105). Among these patients, 31 (29.52%) had mild anxiety symptoms, 30 (28.57%) had moderate anxiety symptoms, and 4 (3.81%) had severe anxiety symptoms (Figure 2A). The average HADS-D score was 7.73 ± 2.91, with a depression symptoms prevalence of 55.24%. Among the patients, 47 (44.76%) did not have depression, 36 (34.29%) had mild depression symptoms, 21 (20.00%) had moderate depression symptoms, and 1 (0.95%) had severe depression symptoms (Figure 2B). There were 58 patients (55.24%) with both anxiety and depression symptoms, with a mean self-rating anxiety (SAS) score of 10.91 ± 2.26 and a mean self-rating depression (SDS) score of 9.74 ± 1.92. Seven patients (6.67%) had anxiety symptoms but no depression symptoms, with a mean SAS score of 10.71 ± 2.14 and a mean SDS score of 5.00 ± 2.38. Additionally, 40 patients (38.10%) had neither anxiety nor depression, with an average SAS score of 5.20 ± 1.51 and an average SDS score of 5.28 ± 1.55 (Figure 2C).

Univariate Analysis of Anxiety and Depression

Based on the HADS-A scores, patients were divided into 2 groups: non-anxiety (score ≤7) and anxiety symptoms group (score >7). Univariate analysis revealed that monthly household income, marital status, seizure occurrence, sleep quality, and cognitive impairment were significantly associated with anxiety symptoms in glioma patients (all $P < .05$) (Table 2). Similarly, based on the HADS-D scores, patients were divided into 2 groups: non-depression (score ≤7) and depression symptoms group (score >7). Univariate analysis showed that monthly household income, marital status, tumor recurrence, seizure occurrence, sleep quality, and cognitive impairment were significantly associated with depression symptoms in glioma patients (all $P < .05$) (Table 3).

Analysis of Risk Factors for Anxiety and Depression

Further binary logistic regression analysis revealed that monthly household income, seizure occurrence, sleep quality, and cognitive impairment were independent

Table 1. Patients' Characteristics

Variable	Patients [n (%)]	Variable	Patients [n (%)]
Age (years)	53.77 ± 11.82	Sex	
Education level		Female	48 (45.71)
High school and below	65 (61.90)	Male	57 (54.29)
College or above	40 (38.10)	Marital status	
Monthly household income (CNY)		Unmarried	10 (9.52)
≤5000	71 (67.62)	Married	63 (60.00)
>5000	34 (32.38)	Get divorced	19 (18.10)
Place of residence		Widowed spouse	13 (12.38)
Rural	23 (21.90)	Employment Status	
Towns and cities	82 (78.10)	Unemployment	81 (77.14)
Headache		On the job	24 (22.86)
No	34 (32.38)	Tumor recurrence	
Sometimes	51 (48.57)	Yes	71 (67.62)
Often	20 (19.05)	No	34 (32.38)
Hair loss		Seizure Occurrence	
No	18 (17.14)	No	66 (62.86)
Slight	47 (44.76)	Yes	39 (37.14)
Serious	40 (38.10)	Fatigue	
Sleep		No	29 (27.62)
Normal	21 (20.00)	Slight	67 (63.81)
Worse off	59 (56.19)	Serious	9 (8.57)
Vary bad	25 (23.81)	Appetite	
Diarrhea	4.0 (1.0, 5.0)	Normal	28 (26.67)
Cognitive impairment		Worse off	71 (67.62)
Yes	53 (50.48)	Very bad	6 (5.71)
No	52 (49.52)		

risk factors for anxiety symptoms in glioma patients (P < .05) (Table 4). The risk factors for depression symptoms included monthly household income, marital status, seizure occurrence, sleep quality, and cognitive impairment (P < .05) (Table 5).

DISCUSSION

Previous research has reported that glioma patients are more prone to anxiety and depression compared to patients with other types of cancer.[22-24] There are 2 possible reasons for this. First, the tumor itself may affect certain areas of the brain, interfering with neural transmission and leading to changes in mood and behavior. Second, glioma has a poor prognosis, with a median survival time of only 14.6 months and a 5-year survival rate of approximately 7.2%, which imposes significant psychological stress on patients. Furthermore, treatments such as radiotherapy and chemotherapy can cause a series of side effects, including fatigue, nausea, and headaches, which may further exacerbate depression and anxiety. Studies have reported that the incidence of anxiety in glioma patients ranges from 30% to 63%, and the incidence of depression ranges from 30% to 50%.[17] Another study found that the anxiety incidence rate in patients with recurrent glioma was 58.8%, while it was 32.5% in newly diagnosed patients;[25] the depression incidence rate was 45% in recurrent patients and 30% in newly diagnosed patients. In this study, the average HADS-A score for glioma patients was 8.72 ± 3.41, with an anxiety symptoms prevalence of 61.90%, and 33.33% of patients experiencing moderate to severe anxiety symptoms. The average HADS-D score was 7.73 ± 2.91, with a depression symptoms prevalence of 55.24%, and 20.95% of patients experiencing moderate to severe depression symptoms. In addition, a considerable number of patients have both anxiety and depression symptoms (55.24%). In the survey of other populations,[26] anxiety and depression are 2 variables with significant positive correlation, and the 2 may influence each other. The results of this study show that 55.24% of patients exhibited both anxiety and depression symptoms. As a major disease, brain glioma not only causes long-term excessive pressure for patients but also is a negative stimulus factor.

This research primarily explores the causal relationship between disease symptoms and treatment side effects and the symptoms of anxiety and depression. To further investigate the risk factors for anxiety and depression symptoms in glioma patients, univariate and binary logistic regression analyses were conducted. The results indicated that low monthly household income, the presence of seizures, sleep disturbances, and cognitive impairment are significant risk factors for anxiety and depression symptoms. The reasons for these findings are analyzed as follows: (1) Monthly Household Income: Although no previous studies have identified family income as a risk factor for anxiety and depression in patients with glioma,[27] research on breast cancer and differentiated thyroid cancer has found a correlation between monthly household income and depression and anxiety.[20,28] Glioma is a disease that requires long-term treatment and frequent follow-up, subjecting patients to high medical expenses for surgeries, radiotherapy, chemotherapy, and other treatments. Consequently, the financial burden on families rises significantly. For households with lower monthly incomes, the ongoing treatment costs can lead to an overwhelming financial strain, creating psychological pressure for both the patient and the family. This stress may not only diminish the patient's QoL but also foster persistent anxiety and concern regarding their future health and financial stability. Additionally, economic hardship may cause patients to feel like a financial burden

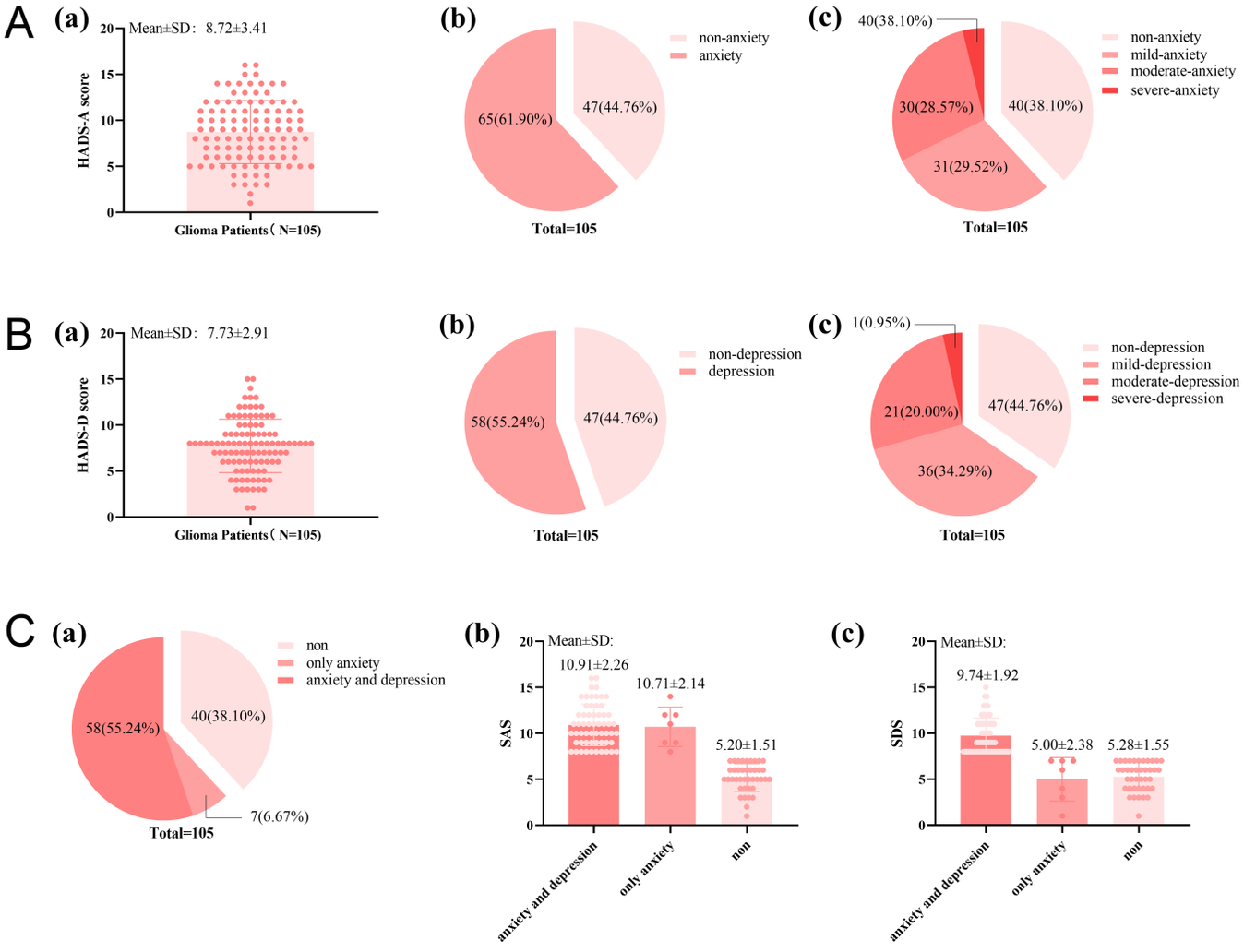

Figure 2. Anxiety and Depression Symptoms Assessment in Glioma Patients. A: (a) Average HADS-A score. (b) Proportion of patients without anxiety versus those with anxiety symptoms. (c) Proportion of patients with different severity levels of anxiety symptoms. B: (a) Average HADS-D score. (b) Proportion of patients without depression versus those with depression symptoms. (c) Proportion of patients with different severity levels of depression symptoms. C: (a) The percentage of patients with concurrent anxiety and depression symptoms. (b) SAS scores for patients with combined anxiety and depression symptoms. (c) SDS scores for patients with combined anxiety and depression symptoms. HADS-A, hospital anxiety and depression scale-anxiety; HADS-D, hospital anxiety and depression scale-depression; SAS, self-rating anxiety; SD, standard deviation; SDS, self-rating depression.

to their families, often resulting in a sense of guilt and self-doubt, exacerbating depressive emotions. Financial pressure can also limit treatment options, as patients may consider reducing or foregoing certain high-cost treatments, further intensifying psychological strain. (2) Seizure Occurrence: Studies have indicated that 30%-50% of glioma patients exhibit seizure symptoms.[29,30] Seizures not only impair cognitive function but also reduce overall survival time. In the study by Günerhan et al,[9] patients with seizures had poorer functional status assessments and longer hospital stays compared to those without seizures. Seizures are often sudden and violent, traumatic for both patients and their families, and tend to lead to symptoms of anxiety and depression. Mental illness may be related to brain hypoxia and inflammation caused by epilepsy, and the drugs used to treat epilepsy may also induce symptoms of mental illness. However, the pathological mechanisms are not fully understood, and there is still a lack of relevant research on this topic.[2] (3) Sleep Disturbances: Sleep disturbances are also common symptoms in patients with primary brain tumors. Research has shown that sleep disturbances are an independent risk factor for reduced QoL in brain tumor patients.[31] Glioma patients are often anxious and fearful due to concerns about their illness, leading to increased brain activity at night, which makes it difficult for them to fall asleep. Daytime listlessness and nighttime insomnia are also common symptoms of depression, marked by excessive pessimism about the disease, low mood, and a lack of interest in all activities, ultimately resulting in a decline in QoL.[32] (4) Cognitive Impairment: Cognitive impairment is a common symptom in glioma patients, manifesting as learning and memory

Table 2. Univariate Analysis of Anxiety in Glioma Patients [n (%)]

Variable		Non-Anxiety Group (n = 40)	Anxiety Symptoms Group (n = 65)	*P*
Age (years)		55.53 ± 11.00	52.69 ± 12.26	.235
Sex	Female	23 (57.50)	34 (52.31)	.604
	Male	17 (42.50)	31 (47.69)	
Education level	High school and below	25 (62.50)	40 (61.54)	.922
	College or above	15 (37.50)	25 (38.46)	
Monthly household income (CNY)	≤5000	22 (55.00)	49 (75.38)	**.030**
	>5000	18 (45.00)	16 (24.62)	
Marital status	Unmarried	2 (5.00)	8 (12.31)	**.005**[a]
	Married	32 (80.00)	31 (47.69)	
	Get divorced	2 (5.00)	17 (26.15)	
	Widowed spouse	4 (10.00)	9 (13.85)	
Employment Status	Unemployment	27 (67.50)	54 (83.08)	.065
	On the job	13 (32.50)	11 (16.92)	
Place of residence	Rural	8 (20.00)	15 (23.08)	.711
	Towns and cities	32 (80.00)	50 (76.92)	
Tumor recurrence	Yes	23 (57.50)	48 (73.85)	.082
	No	17 (42.50)	17 (26.15)	
Seizure occurrence	No	32 (80.00)	34 (52.31)	**.004**
	Yes	8 (20.00)	31 (47.69)	
Headache	No	14 (35.00)	20 (30.77)	.698
	Sometimes	20 (50.00)	31 (47.69)	
	Often	6 (15.00)	14 (21.54)	
Hair loss	No	9 (22.50)	9 (13.85)	.446
	Slight	18 (45.00)	29 (44.61)	
	Serious	13 (32.50)	27 (41.54)	
Fatigue	No	14 (35.00)	15 (23.08)	.420[a]
	Slight	23 (57.50)	44 (67.69)	
	Serious	3 (7.50)	6 (9.23)	
Sleep quality	Normal	15 (37.50)	6 (9.23)	**.000**
	Worse off	21 (52.50)	38 (58.46)	
	Very bad	4 (10.00)	21 (32.31)	
Appetite	Normal	14 (35.00)	14 (21.54)	.255[a]
	Worse off	25 (62.50)	46 (70.77)	
	Very bad	1 (2.50)	5 (7.69)	
Diarrhea		4.0 (0.0, 5.0)	4.0 (2.5, 5.5)	.225
Cognitive impairment	No	27 (67.50)	25 (38.46)	**.004**
	Yes	13 (32.50)	40 (61.54)	

[a]Fisher's exact test. Bold indicates $P < 0.05$.

deficits. These impairments are progressive and long-lasting. A study has shown that cognitive impairment can lead to degenerative changes in neural regions and circuits responsible for processing emotions, and this degeneration of neural function can contribute to the onset of anxiety and depression.[33] Additionally, cognitive impairment often causes delays in various senses, such as sight, touch, smell, and hearing, which impacts patients' lives and can further lead to symptoms of anxiety and depression.[34] In addition, cognitive function is also affected by anxiety and depression, which can exacerbate cognitive impairment. At the same time, epilepsy has a more severe negative impact on cognitive function than other types of brain disorders, although the specific underlying pathological mechanisms remain unclear.[11]

The findings of this study not only reveal multiple risk factors for anxiety and depression in patients with neuroglioma but also provide new directions for future

Table 3. Univariate Analysis of Depression in Glioma Patients [n (%)]

Variable		Non-Depression Group (n = 47)	Depression Symptoms Group (n = 58)	*P*
Age (years)		55.68 ± 11.35	52.22 ± 12.07	.137
Sex	Female	26 (55.32)	31 (53.45)	.848
	Male	21 (44.68)	27 (46.55)	
Education level	High school and below	30 (63.83)	35 (60.34)	.715
	College or above	17 (36.17)	23 (39.66)	
Monthly household income (CNY)	≤5000	26 (55.32)	45 (77.59)	**.015**
	>5000	21 (44.68)	13 (22.41)	
Marital status	Unmarried	3 (6.38)	7 (12.07)	**.007**[a]
	Married	28 (59.57)	25 (43.10)	
	Get divorced	2 (4.26)	17 (29.31)	
	Widowed spouse	4 (8.51)	9 (15.52)	
Employment Status	Unemployment	33 (70.21)	48 (82.76)	.128
	On the job	14 (29.79)	10 (17.24)	
Place of residence	Rural	9 (19.15)	14 (24.14)	.539
	Towns and cities	38 (80.85)	44 (75.86)	
Tumor recurrence	Yes	27 (57.45)	44 (75.86)	**.045**
	No	20 (42.55)	14 (24.14)	
Seizure Occurrence	No	37 (78.72)	29 (50.00)	**.002**
	Yes	10 (21.28)	29 (50.00)	
Headache	No	17 (36.17)	17 (29.31)	.563
	Sometimes	23 (48.94)	28 (48.28)	
	Often	7 (14.89)	13 (22.41)	
Hair loss	No	10 (21.28)	8 (13.79)	.410
	Slight	22 (46.81)	25 (43.10)	
	Serious	15 (31.91)	25 (43.11)	
Fatigue	No	16 (34.04)	13 (22.41)	.461[a]
	Slight	27 (57.45)	40 (68.97)	
	Serious	4 (8.51)	5 (8.62)	
Sleep quality	Normal	17 (36.17)	4 (6.90)	**.000**
	Worse off	25 (53.19)	34 (58.62)	
	Very bad	5 (10.64)	20 (34.48)	
Appetite	Normal	16 (34.04)	12 (20.69)	.309[a]
	Worse off	29 (61.70)	42 (72.41)	
	Very bad	2 (4.26)	4 (6.90)	
Diarrhea		4.0 (0.0, 6.0)	4.0 (2.5, 5.0)	.536
Cognitive impairment	No	31 (65.96)	21 (36.21)	**.002**
	Yes	16 (34.04)	37 (63.79)	

[a]Fisher's exact test. Bold indicates $P < 0.05$.

clinical interventions. For patients with lower household income, financial hardship is a crucial independent risk factor for anxiety and depression symptoms. Hospitals and social welfare organizations should establish financial assistance programs or offer free/low-cost psychological support services to glioma patients from low-income households.[35] For patients experiencing frequent epileptic seizures, neurologists and oncologists should adopt aggressive seizure management strategies. This could include optimizing anti-epileptic medication regimens or employing surgical interventions when applicable.[36] Future research could assess whether improved seizure control correlates with reduced psychological distress. Sleep quality, identified as a significant risk factor, can be improved through tailored interventions such as sleep hygiene education, cognitive-behavioral therapy for insomnia, or pharmacological treatments (e.g., melatonin or sedatives). Randomized controlled trials

Table 4. Risk Factors for Anxiety Symptoms in Glioma Patients

Variable	*P*	OR	95% CI	
			Lower	Upper
Monthly household income (CNY) (≤5000 vs. >5000)	**.019**	0.263	0.087	0.802
Marital status				
Unmarried	Ref.			
Married	.075	0.171	0.024	1.192
Get divorced	.912	1.153	0.092	14.252
Widowed spouse	.307	0.303	0.031	3.001
Seizure occurrence (No vs. Yes)	**.007**	5.466	1.590	18.799
Sleep quality				
Normal	Ref.			
Worse off	**.012**	5.973	1.493	23.899
Very bad	**.001**	18.720	3.232	108.435
Cognitive impairment (No vs. Yes)	**.002**	5.873	1.919	17.974

The *P*-values for the Logistic regression model is 0.016. Bold indicates $P < 0.05$.
OR, odds ratio; Ref, reference.

could be designed to evaluate the effectiveness of these interventions in glioma patients.[37] For cognitive impairments, cognitive rehabilitation programs, including memory training, attention improvement exercises, and medication (e.g., cholinesterase inhibitors), should be integrated into the management of glioma patients to address this issue.[38] Clinical trials to evaluate their effectiveness in alleviating psychological symptoms are warranted. These interventions should be carried out through the collaboration of a multidisciplinary team, including neurologists, psychologists, occupational therapists, and social workers. Through these comprehensive intervention measures, patients with neuroglioma can be more holistically supported, with a focus not only on their physical treatment but also on their psychological and cognitive health, to enhance their overall QoL. Additionally, while the above strategies are based on established literature and clinical practice, their specific effectiveness in glioma patients requires further validation. Future studies should focus on designing and implementing intervention programs targeted at these risk factors and assessing their impact on anxiety and depression symptoms through longitudinal or interventional studies. Key metrics could include changes in HADS scores, QoL indices, and patient-reported outcomes.

This study has several limitations: (1) Single-Center Study and Sample Size: This study was conducted at a single center with a relatively small sample size, which may result in some variables having overly large odds ratio (OR) values in the binary logistic regression analysis.

Table 5. Risk Factors for Depression Symptoms in Glioma Patients

Variable	*P*	OR	95% CI	
			Lower	Upper
Monthly household income (CNY) (≤5000 vs. >5000)	**.004**	0.164	0.047	0.564
Marital status				
Unmarried	Ref.			
Married	**.023**	0.086	0.010	0.709
Get divorced	.957	1.078	0.070	16.651
Widowed spouse	.289	0.249	0.019	3.257
Tumor recurrence (No vs. Yes)	.165	0.360	0.085	1.525
Seizure occurrence (No vs. Yes)	**.008**	5.388	1.563	18.573
Sleep quality				
Normal	Ref.			
Worse off	**.008**	9.676	1.790	52.309
Very bad	**.001**	35.791	4.718	271.534
Cognitive impairment (No vs. Yes)	**.002**	6.898	2.041	23.316

The *P*-values for the Logistic regression models is 0.047 Bold indicates $P < 0.05$.
OR, odds ratio; Ref, reference.

Future research will include a larger sample size for more in-depth analysis. (2) Coarse Variable Stratification: The stratification of variables in this study was relatively coarse. In future research, more appropriate and reliable scales will be used to assess various symptoms and treatment side effects of glioma, and their impact on patients' anxiety and depression will be analyzed in detail. (3) Lack of Comparison Across Disease Stages and Treatment Phases: This study included all glioma patients without comparing symptoms and side effects at different stages of the disease and treatment phases, nor their relationship with anxiety and depression. Future research will address this aspect for improvement. (4) Mainly Relies on Questionnaire Surveys and Scale Evaluations: This study lacks objective biological indicators to further verify the relationship between psychological factors and physiological states. In future studies, more scientific and objective observation indicators will be adopted as far as possible to make the research results more reliable.

In conclusion, glioma patients have a high incidence of anxiety and depression symptoms. Low monthly household income, presence of seizures, poor sleep quality, and cognitive impairment are significant risk factors that exacerbate anxiety and depression symptoms. Healthcare providers should manage disease symptoms and treatment side effects effectively, increase social support for patients, and improve their QoL, which may help reduce the symptoms of anxiety and depression.

Data Availability Statement: The data and materials for this experiment are available.

Ethics Committee Approval: Ethics Committee of the Longgang Central Hospital of Shenzhen (Approval Number: 2023ECPJ103 Date: December 28, 2023).

Informed Consent: Written informed consent was obtained from the participants who agreed to take part in the study.

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