Scholars Journal of Arts, Humanities and Social Sciences
OPEN ACCESS
Abbreviated Key Title: Sch J Arts Humanit Soc Sci
ISSN 2347-9493 (Print) | ISSN 2347-5374 (Online)
Journal homepage: https://saspublishers.com

Clinical Characteristics and Surgical Outcomes of Meningioma Patients: A Single-Center Retrospective Study in a Rural Population

Kailiang Wei[1], Xiao Wang[2], Shenyu Li[1], Meiyuan Tang[2*]

[1]Department of Neurosurgery, The Second Affiliated Hospital of Guilin Medical University, Guangxi, China
[2]Department of Clinical Laboratory, The First Affiliated Hospital of Guilin Medical University, Guangxi, China

DOI: https://doi.org/10.36347/sjahss.2026.v14i03.002 | **Received:** 04.02.2026 | **Accepted:** 17.03.2026 | **Published:** 19.03.2026

***Corresponding author:** Meiyuan Tang
Department of Clinical Laboratory, The First Affiliated Hospital of Guilin Medical University, Guangxi, China

Abstract **Original Research Article**

This study conducted a retrospective analysis of 72 meningioma patients (47 females, 25 males; mean age 60.2±11.4 years) admitted to our institution between January 2020 and December 2024, to investigate their clinical characteristics and treatment outcomes. As the most common primary intracranial tumor in adults, understanding the clinical characteristics of meningioma patients in specific populations is crucial for optimizing healthcare resource allocation and improving patient prognosis. The results revealed a female-to-male ratio of 1.9:1, with the majority of patients (75.0%) being farmers. The most common tumor location was the frontal/parasellar region (40.3%), and 73.6% (53/72) of patients underwent surgical treatment. Compared to non-surgical patients, surgical patients had significantly longer hospital stays (20.0±8.0 days vs. 6.6±2.7 days, P<0.001) and higher hospitalization costs (¥70,135.8±27,871.0 vs. ¥6,814.8±2,914.0, P<0.001), with a strong positive correlation between hospitalization costs and length of stay (r=0.802, P<0.001). The rate of physician-directed discharge was significantly higher in the surgical group compared to the non-surgical group (96.2% vs. 63.2%, P=0.001). This study reveals distinct clinical characteristics of meningioma patients in rural populations, with a predominance of farmers and females. Although surgical treatment is associated with longer hospitalizations and higher medical costs, it is also associated with favorable discharge outcomes, offering valuable insights for healthcare planning in rural areas.

Keywords: Meningioma; Neurosurgery; Rural Health; Treatment Outcomes; Hospitalization Costs.

INTRODUCTION

Meningioma is the most common primary intracranial tumor in adults, accounting for 36.4% of all primary brain tumors [1]. These tumors originated from arachnoid cap cells, which are usually slow-growing and benign [2]. The incidence of meningioma increases with age, reaching a peak at the age of 60 to 70 [3]. Notably, meningiomas demonstrate a significant female predominance, with female-to-male ratios ranging from 2:1 to 4:1, which has been attributed to hormonal influences [4].

The clinical manifestations of meningiomas vary greatly depending on the location, size and growth rate of the tumor. Common symptoms include headache, seizures, focal neurological deficits and cognitive changes [5]. Although many meningiomas can be treated conservatively with observation, surgical resection is still the final treatment for symptomatic or growing lesions. The range of surgical resection and histological grade are important prognostic factors for recurrence [6].

Rural populations are facing unique challenges in accessing professional neurosurgical care, including geographical barriers, limited medical infrastructure, and socio-economic factors [7]. Understanding the clinical features, treatment patterns and prognosis of meningioma patients in rural areas is very important for formulating targeted medical strategies and optimizing resource allocation. However, data about the epidemiology and management of meningiomas in rural areas of China are still limited.

The purpose of this study was to describe the demographic and clinical characteristics of meningioma patients in a rural population, compare the results of surgical and non-surgical treatment, determine the factors related to hospitalization expenses and length of stay, and provide evidence-based medical insights for improving the treatment of meningioma under limited resources.

MATERIALS AND METHODS

Study Design and Population

This retrospective study was conducted in the Second Affiliated Hospital of Guilin Medical University, which is a tertiary hospital serving the rural population in Guangxi, China. We reviewed the medical records of all patients diagnosed with meningioma from January 2020 to December 2024. The inclusion criteria are: (1) age ≥18 years old; (2) Radiological or histopathological diagnosis of meningioma; (3) Complete medical records. Exclusion criteria include: (1) Recurrent meningiomas that have not been treated in our institution; (2) Incomplete clinical data; (3) Malignant tumor. This project has been approved by the Ethics Committee of our hospital.

Data Collection

In this study, the relevant data of patients were extracted from the electronic medical record system, including demographic characteristics (age, sex, occupation and place of residence), clinical characteristics (clinical symptoms, tumor site, WHO classification and complications), treatment characteristics (surgical methods, incision classification, healing status and complications) and outcome measures (hospitalization time, total hospitalization expenses and discharge treatment). Among them, according to preoperative imaging and surgical findings, the tumor site is divided into the following areas: frontal/parasellar, temporal lobe, parietal lobe, occipital lobe, sphenoid ridge, cerebral falx/falx, cerebellar tentorium, petroclival region, cerebellopontine angle and ventricular region.

Statistical Analysis

SPSS version 25.0 and Python 3.1 were used for statistical analysis. Continuous variables are expressed as mean standard deviation (SD) or median (range) based on the normality of distribution, while classified variables are expressed as frequencies and percentage. For group comparisons, the independent samples t - test was applied to normally distributed continuous variables, the Mann - Whitney U test to non - normally distributed ones, and one - way ANOVA for comparisons among three or more groups; Categorical variables were analyzed using the chi-square test or Fisher's exact test, as appropriate. P-value < 0.05 was considered statistically significant.

Quality Control

Data extraction was carried out by two independent researchers, and the differences were resolved through consultation. 10% cases were randomly sampled to verify the accuracy of the data. Missing data were processed by complete case analysis.

RESULTS

Demographic Characteristics

In total, 72 patients were included in the study. The demographic characteristics are summarized in table 1. The average age was 60.2 11.4 years (range: 37-86 years), and the median age was 59.0 years old. The majority of patients were female (65.3%, n = 47), resulting in a female-to-male ratio of 1.9: 1. The age distribution showed that the age group of 50-59 reached the peak (37.5%), followed by the age groups of 60-69 and ≥ 70, with the same proportion (23.6% each). As far as occupation is concerned, farmers account for the vast majority (75.0%), reflecting the rural coverage of our institution.

Table 1: Demographic Characteristics of Meningioma Patients (n=72)

Variable	n	Percentage (%)
Sex		
Female	47	65.3
Male	25	34.7
Age (years, mean±SD)	60.2±11.4	-
Age (median, range)	59.0 (37-86)	-
Age group		
<40 years	2	2.8
40-49 years	9	12.5
50-59 years	27	37.5
60-69 years	17	23.6
≥70 years	17	23.6
Occupation		
Farmer	54	75
Other	8	11.1
Retired	4	5.6
Worker	3	4.2
Clerk	2	2.8
Unemployed	1	1.4

Clinical Characteristics and Treatment Patterns

Clinical features are shown in table 2. In general, 73.6% (53/72) patients received surgical treatment, while 26.4% (19/72) patients received conservative treatment. The decision for conservative treatment was based on many factors, including old age, significant complications, asymptomatic small lesions or patient preference. Among surgical patients, only 11.3% (6/53) cases can obtain WHO histological classification, and most of them are grade I (5.7%). The low rate of pathological grade reflects that in some cases, intraoperative diagnoses are dominant, and there is no formal pathological review afterwards. The mean length of hospital stay was 16.5±9.2 days, with a median of 15.0 days. Notably, 29.2% of patients had prolonged hospitalization (>21 days). Mean hospitalization costs were ¥53,426.1±36,890.4 (approximately $7,400 USD), with substantial variation ranging from ¥2,698 to ¥153,553.

Table 2: Clinical Characteristics of Meningioma Patients (n=72)

Variable	n	Percentage (%)
Treatment modality		
Surgical	53	73.6
Non-surgical	19	26.4
WHO grade		
WHO Grade I	3	5.7
WHO Grade II	2	3.8
WHO Grade III	1	1.9
Not graded	47	88.7
Discharge disposition		
Physician-directed	63	87.5
Non-physician-directed	9	12.5
Length of stay (days, mean±SD)	16.5±9.2	-
Length of stay (median, range)	15.0 (3-42)	-
Length of stay group		
≤7 days	14	19.4
8-14 days	20	27.8
15-21 days	17	23.6
>21 days	21	29.2
Hospitalization costs (Yuan, mean±SD)	53,426.1±36,890.4	-
Hospitalization costs (median, range)	58,634.9 (2,698-153,553)	-

Comparison Between Surgical and Non-Surgical Patients

Table 3 shows a comparison between surgical patients and non-surgical patients. Surgical patients were younger on average (58.7±11.0 vs. 64.3±11.7 years), though this difference did not reach statistical significance (p = 0.066). There was no significant difference in sex distribution between groups (p = 0.082). Surgical patients had significantly longer hospital stays (20.0±8.0 vs. 6.6±2.7 days, P<0.001) and higher hospitalization costs (¥70,135.8±27,871.0 vs. ¥6,814.8±2,914.0, P<0.001). The cost difference was approximately 10-fold. Importantly, surgical patients had a significantly higher rate of physician-directed discharge (96.2% vs. 63.2%, P=0.001), suggesting better clinical outcomes and readiness for discharge.

Table 3: Comparison Between Surgical and Non-Surgical Patients

Characteristic	Surgical (n=53)	Non-Surgical (n=19)	P-value
Age (years, mean±SD)	58.7±11.0	64.3±11.7	0.066
Sex [n(%)]			
Female	31 (58.5)	16 (84.2)	
Male	22 (41.5)	3 (15.8)	0.082
Length of stay (days, mean±SD)	20.0±8.0	6.6±2.7	<0.001*
Hospitalization costs (Yuan, mean±SD)	70,135.8±27,871.0	6,814.8±2,914.0	<0.001*
Discharge disposition [n(%)]			
Physician-directed	51 (96.2)	12 (63.2)	
Non-physician-directed	2 (3.8)	7 (36.8)	0.001*

*P<0.05, statistically significant

Analysis by Sex

Table 4 shows the comparison between the male and female patients. There are no significant differences between sexes in age, treatment, length of stay, hospitalization expenses or discharge arrangements. While not statistically significant, there was a trend toward higher surgical rates in male patients (88.0% vs. 66.0%, P=0.082).

Table 4: Comparison Between Female and Male Patients

Characteristic	Female (n=47)	Male (n=25)	P-value
Age (years, mean±SD)	60.5±11.8	59.6±10.8	0.749
Treatment modality [n(%)]			0.082
Surgical	31 (66.0)	22 (88.0)	
Non-surgical	16 (34.0)	3 (12.0)	
Length of stay (days, mean±SD)	15.4±8.6	18.5±10.1	0.182
Hospitalization costs (Yuan, mean±SD)	50,581.3±38,540.8	58,774.4±33,665.3	0.373
Discharge disposition [n(%)]			0.64
Physician-directed	40 (85.1)	23 (92.0)	
Non-physician-directed	7 (14.9)	2 (8.0)	

Analysis by Age Group

Patients were divided into < 60 years old group and ≥60 years old group (Table 5). Compared with the elderly patients, young patients (< 60 years old) showed a trend of higher operation rate (84.2% vs 61.8%, P=0.059), although this did not reach statistical significance. No significant differences were observed in length of stay, hospitalization costs, or discharge disposition between age groups.

Table 5: Comparison Between Age Groups

Characteristic	<60 years (n=38)	≥60 years (n=34)	P-value
Sex [n(%)]			
Female	23 (60.5)	24 (70.6)	
Male	15 (39.5)	10 (29.4)	0.517
Treatment modality [n(%)]			
Surgical	32 (84.2)	21 (61.8)	
Non-surgical	6 (15.8)	13 (38.2)	0.059
Length of stay (days, mean±SD)	15.3±7.7	17.8±10.6	0.267
Hospitalization costs (Yuan, mean±SD)	55,928.2±35,428.5	50,629.7±38,799.8	0.547
Discharge disposition [n(%)]			
Physician-directed	34 (89.5)	29 (85.3)	
Non-physician-directed	4 (10.5)	5 (14.7)	0.858

Tumor Location Distribution

Tumor location distribution is presented in table 6. The frontal/parasellar region was the most common location (40.3%), followed by the parietal region (26.4%) and falx/parafalcine region (9.7%).

Table 6: Distribution of Meningioma Locations (n=72)

Location	n	Percentage (%)
Frontal/Parasellar	29	40.3
Parietal	14	19.4
Other/Not specified	14	19.4
Falx/Parafalcine	7	9.7
Temporal	5	6.9
Occipital	5	6.9
Sphenoid ridge	3	4.2
Tentorial	2	2.8
Petroclival	2	2.8
Cerebellopontine angle	1	1.4
Intraventricular	1	1.4

Correlation Analysis

Table 7 presents the correlation analysis between continuous variables. A strong positive correlation was observed between hospitalization costs and length of stay (r=0.802, P<0.001), indicating that prolonged hospitalization is the primary driver of increased costs. Neither age nor length of stay showed significant correlation with age, suggesting that hospitalization duration and costs are independent of patient age in this cohort.

Table 7: Correlation Analysis Between Continuous Variables (Pearson Correlation)

Variable 1	Variable 2	Correlation Coefficient	P-value
Age	Hospitalization costs	-0.001	0.994
Age	Length of stay	0.12	0.316
Hospitalization costs	Length of stay	0.802	<0.001*

*P<0.05, statistically significant

Hospitalization Costs by Length of Stay in Surgical Patients

Table 8 analyzes hospitalization costs stratified by length of stay in surgical patients. Costs increased significantly with longer hospitalization (P=0.001 by ANOVA). Patients with hospitalization >21 days had mean costs of ¥85,420.2±22,915.9, compared to ¥52,740.3±17,115.3 for those with ≤14 days stay.

Table 8: Analysis of Hospitalization Costs by Length of Stay in Surgical Patients

Length of stay group	n	Mean cost (Yuan)	Median cost (Yuan)	SD	F	P
≤14 days	15	52,740.30	55,715.90	17,115.30		
15-21 days	17	66,604.30	66,616.90	31,753.40		
>21 days	21	85,420.20	86,780.20	22,915.90	7.855	<0.001*

*P<0.05, statistically significant

Analysis by Occupation

Given the predominance of farmers in our cohort, we compared farmers (n=54) with non-farmers (n=18) (Table 9). No significant differences were observed between groups in any measured characteristic (all P>0.05).

Table 9: Comparison Between Farmers and Non-Farmers

Characteristic	Farmers (n=54)	Non-Farmers (n=18)	P-value
Age (years, mean±SD)	59.0±10.6	63.9±13.2	0.113
Sex [n(%)]			
Female	36 (66.7)	11 (61.1)	
Male	18 (33.3)	7 (38.9)	0.886
Treatment modality [n(%)]			
Surgical	40 (74.1)	13 (72.2)	
Non-surgical	14 (25.9)	5 (27.8)	1.000
Length of stay (days, mean±SD)	16.1±8.6	17.7±11.1	0.533
Hospitalization costs (Yuan, mean±SD)	54,602.5±36,777.4	49,897.1±38,070.0	0.643
Discharge disposition [n(%)]			
Physician-directed	47 (87.0)	16 (88.9)	
Non-physician-directed	7 (13.0)	2 (11.1)	1.000

DISCUSSION

This retrospective study on 72 cases of meningioma in rural areas of China revealed several important findings. First, we observed a significant female predominance (65.3%) with a female-to-male ratio of 1.9: 1, consistent with the well-established epidemiological pattern of meningiomas [1, 4]. The average age is 60.2 years old, which is consistent with previous reports, indicating that the peak incidence rate appeared in the sixth decade and seventh decades [3]. Second, our study highlights the rural nature of our patient population, with 75% being farmers. This demographic composition has important impact on the provision of medical care, because patients in rural areas often face various obstacles, including delayed diagnosis, limited access to professional care and socio-economic constraints [8, 9]. Third, surgical treatment was associated with significantly better discharge outcomes (96.2% physician-directed discharge) despite longer hospitalization and higher costs. This shows that if properly chosen, surgical intervention can achieve good clinical results even in rural people.

The female-to-male ratio of 1.9: 1 in our study is consistent with global epidemiological data. According to a large population-based study in the United States, the ratio of women to men in all meningiomas is 2.3:1[10], while the ratio from Asian populations is 1.8: 1 to 3.2: 1[11]. In our surgical queue, men are slightly dominant (41.5% versus 34.7%), which may reflect selection bias, because male patients in our sample are more likely to undergo surgery (88.0% versus 66.0%, although there is no statistical significance). In our research, the average hospitalization cost is 53,426 pounds (about 7,400 US dollars), which is far lower than that reported by western countries. A study from the United States reported that the average costs of meningioma surgery were 46,631 dollars, while a study in Germany reported that the average costs was 18,447 dollars [12, 13]. This difference in cost probably reflects the differences in health care systems, reimbursement structures and living cost. However, considering the local income levels, the economic burden on rural patients in China is still very heavy.

In our surgical cohort, the excellent wound healing rate (98.1% Grade A) and low incidence of complication indicate that the quality of surgery is sufficient in rural areas. The advantage of Class I incision (98.1%) reflects proper preoperative preparation and antibiotic prevention. However, the lack of systematic pathological grading (88.7% not graded) represents a quality gap that needs to be solved, because WHO grading is crucial for prognosis and follow-up plan [7].

The strong correlation between hospitalization expenses and hospitalization time (r = 0.802) shows that prolonging hospitalization time is the main cost driver. This finding is consistent with the literature of medical economics, indicating that hospitalization days constitute the largest part of hospitalization expenses Strategies to shorten hospital stay, such as enhanced postoperative recovery (ERAS), could significantly reduce costs without affecting the curative effect [14, 15]. The 10-fold cost difference between surgical patients and non-surgical patients (70,136 vs 6,815) highlights the resource-intensive nature of neurosurgical intervention. However, the high rate (36.8%) of non-surgical patients discharged without doctor's guidance indicates that conservative treatment may be related to unresolved clinical problems or patients' dissatisfaction, which may potentially leading to readmission or extra medical care utilization not included in this study.

In our queue, the advantage of farmers (75%) reflects the rural service area of our hospital, and emphasizes the importance of obtaining neurosurgical care in rural areas. Despite potential health care obstacles, we observed that there were no significant differences between farmers and non-farmers in the treatment mode or results, which indicated fair access within our medical care system. However, the relatively high age of seeing a doctor (60.2 years on average) may indicate that the diagnosis of the rural population is delayed, and access to images and expert consultation there may be limited. It is possible to improve the results and reduce the complexity of treatment by improving screening and primary health care capacity for early detection.

There are several limitations to this study. First of all, the retrospective design and single-center property limit the generalization and may introduce selection bias. Secondly, the relatively small sample size (n = 72) limits statistical efficacy of subgroup analyses. Thirdly, most surgical patients lack systematic pathological grading, which excludes the analysis of histological factors affecting the results. Fourth, we lacked data on long-term outcomes, including recurrence rates, functional status, and quality of life. Future research should focus on prospective multi-center studies to verify our findings, implement systematic pathological examination and grading, long-term follow-up to evaluate recurrence and functional results, cost-benefit analysis of surgery and conservative treatment in specific patient subgroups, and formulate ERAS programs to reduce hospitalization time and costs.

CONCLUSIONS

This study provides important insights into the clinical features and treatment results of patients with meningioma in a rural area of China. The main survey results show that women have a significant advantage (65.3%), and the peak incidence rate is in the age group of 50-59, which is consistent with global epidemiological model, while farmers have an advantage (75%), highlighting the rural nature of this group. Surgically treated patients demonstrated favorable discharge outcomes (96.2% physician-directed discharge) despite higher costs and longer hospitalizations, with length of stay emerging as the primary driver of hospitalization costs (r = 0.802) —identifying a clear target for cost reduction efforts. It is worth noting that there is no significant difference in treatment or results between farmers and non-farmers, which show that care, can be obtained fairly in this medical care system. In a word, these findings provide a foundation for medical care planning and resource allocation in rural neurosurgery practice, and also show that implementation of intensive rehabilitation program and systematic pathological examination could further improve the results and efficiency in meningioma treatment.

REFERENCES

1. Maggio, I., Franceschi, E., Tosoni, A., Nunno, V. D., Gatto, L., Lodi, R., & Brandes, A. A. (2021). Meningioma: not always a benign tumor. A review of advances in the treatment of meningiomas. *CNS oncology*, *10*(2), CNS72.
2. Buerki, R. A., Horbinski, C. M., Kruser, T., Horowitz, P. M., James, C. D., & Lukas, R. V. (2018). An overview of meningiomas. *Future oncology (London, England)*, *14*(21), 2161-2177.
3. Birzu, C., Peyre, M., & Sahm, F. (2020). Molecular alterations in meningioma: prognostic and therapeutic perspectives. *Current opinion in oncology*, *32*(6), 613-622.
4. Soni, N., Ora, M., Bathla, G., Szekeres, D., Desai, A., Pillai, J. J., & Agarwal, A. (2025). Meningioma: Molecular Updates from the 2021 World Health Organization Classification of CNS Tumors and Imaging Correlates. *AJNR. American journal of*

neuroradiology, *46*(2), 240-250.

5. Moussalem, C., Massaad, E., Minassian, G. B., Ftouni, L., Bsat, S., Houshiemy, M., ... &Omeis, I. (2021). Meningioma genomics: a therapeutic challenge for clinicians. *Journal of integrative neuroscience*, *20*(2), 463-469.
6. Nasrallah, M. P., & Aldape, K. D. (2023). Molecular classification and grading of meningioma. *Journal of neuro-oncology*, *161*(2), 373-381.
7. Sescu, D., Chansiriwongs, A., Minta, K. J., Vasudevan, J., & Kaliaperumal, C. (2023). Early Preventive Strategies and CNS Meningioma - Is This Feasible? A Comprehensive Review of the Literature. *World neurosurgery*, *180*, 123-133.
8. Barthélemy, E., Loewenstern, J., Konuthula, N., Pain, M., Hall, J., Govindaraj, S., ... &Shrivastava, R. K. (2018). Primary management of atypical meningioma: treatment patterns and survival outcomes by patient age. *Journal of cancer research and clinical oncology*, *144*(5), 969-978.
9. Elia, G., Mayors Woods, L. E., & Pantilat, S. Z. (2020). End of life care for patients with meningioma. *Handbook of clinical neurology*, *170*, 333-348.
10. Price, M., Ballard, C., Benedetti, J., Neff, C., Cioffi, G., Waite, K. A., ... &Ostrom, Q. T. (2024). CBTRUS Statistical Report: Primary Brain and Other Central Nervous System Tumors Diagnosed in the United States in 2017-2021. *Neuro-oncology*, *26*(Supplement_6), vi1-vi85.
11. Gyawali, S., Sharma, P., & Mahapatra, A. (2019). Meningioma and psychiatric symptoms: An individual patient data analysis. *Asian journal of psychiatry*, *42*, 94-103.
12. Parasher, A. K., Lerner, D. K., Miranda, S. P., Douglas, J. E., Glicksman, J. T., Alexander, T., ... &Adappa, N. D. (2023). In-Hospital Cost Comparison for Open Versus Endoscopic Endonasal Approach for Meningioma Resection. *American journal of rhinology & allergy*, *37*(3), 324-329.
13. Adeberg, S., Harrabi, S. B., Verma, V., Bernhardt, D., Grau, N., Debus, J., & Rieken, S. (2017). Treatment of meningioma and glioma with protons and carbon ions. *Radiation oncology (London, England)*, *12*(1), 193.
14. Karsy, M., Jensen, M. R., Guan, J., Ravindra, V. M., Bisson, E. F., & Couldwell, W. T. (2019). EQ-5D Quality-of-Life Analysis and Cost-Effectiveness After Skull Base Meningioma Resection. *Neurosurgery*, *85*(3), E543-E552.
15. Marastoni, E., & Barresi, V. (2024). Atypical meningioma: Histopathological, genetic, and epigenetic features to predict recurrence risk. *Histology and histopathology*, *39*(3), 293-302.