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Original Research Article

Histopathological Spectrum of Astrocytoma at J.A. Group of Hospitals, Gwalior

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Abstract:

Background: Astrocytomas are among the most common primary central nervous system tumors and exhibit a wide histopathological spectrum ranging from low-grade lesions to highly aggressive glioblastomas. Histopathological evaluation remains the cornerstone for diagnosis, grading, and prognostication.

Aim: To evaluate the histopathological spectrum of astrocytomas diagnosed at J.A. Group of Hospitals, Gwalior.

Methods: This retrospective study was conducted in the Department of Pathology, Gajra Raja Medical College (GRMC), Gwalior, from March 2024 to January 2025. Histopathological records of 200 cases diagnosed as astrocytoma were reviewed. Data regarding age, sex, tumor location, WHO grade, and histopathological subtype were analyzed.

Results: Among 200 astrocytoma cases, 118 (59.0%) were males and 82 (41.0%) females. The majority of patients belonged to the 31–50-year age group (42.0%). Diffuse astrocytoma (WHO Grade II) constituted 34.0% of cases, followed by glioblastoma (Grade IV) accounting for 31.5%. Frontal lobe involvement was the most common location (36.5%). High-grade astrocytomas (Grade III and IV) were significantly more common in patients older than 40 years (p=0.001).

Conclusion: Diffuse astrocytoma and glioblastoma constituted the major histopathological subtypes. Increasing age was significantly associated with higher-grade tumors. Histopathological examination remains essential for accurate classification and prognostic assessment.

Keywords: Astrocytoma, Glioblastoma, Brain tumor, Histopathology, WHO grading.

Introduction

One of the most prevalent types of tumours of the central nervous system are astrocytomas, which are primary glial neoplasms originating from astrocytes. They make up a significant percentage of intracranial neoplasms in all age groups and display a variety of biological behaviours, from low-grade, indolent lesions to highly aggressive glioblastomas. Astrocytic tumours are categorised into various classes by the World Health Organisation (WHO) according to their histological and molecular features [1]. While high-grade tumours show aggressive invasion, quick advancement, and poor survival outcomes, low-grade astrocytomas often show gradual growth and a good prognosis. Although molecular indicators are being incorporated

into more recent WHO categories, conventional diagnostic practice still relies heavily on histological assessment [2].

Astrocytomas can present with different clinical symptoms depending on the tumor's size, location, and grade. Headache, seizures, focal neurological impairments, altered awareness, and cognitive abnormalities are common presenting symptoms. Among the areas most commonly impacted are the frontal and temporal lobes. Histopathologically, astrocytomas include a variety of conditions such as glioblastoma, diffuse astrocytoma, anaplastic astrocytoma, and pilocytic astrocytoma. Age, location, and referral patterns all affect how these subtypes are distributed. Comprehending the local histopathological spectrum is crucial for resource allocation, diagnostic planning, and epidemiological evaluation [3].

Brain tumours are a major cause of neurological morbidity in India, yet there is still a lack of regional data on astrocytoma patterns. Retrospective institutional studies offer important insights into anatomical distribution, tumour grading, and demographic changes. The goal of the current investigation was to assess the histological range of astrocytomas identified at the J.A. Group of Hospitals in Gwalior. Assessment of the distribution of age and sex, anatomical location, prevalence of histological subtypes, and WHO grade distribution were among the goals. The results could add to the body of knowledge already in existence and help pathologists, neurosurgeons, and physicians comprehend the illness profile in the area [4].

Materials and Methods

Study Design

Retrospective observational study.

Study Setting

Department of Pathology, G.R. Medical College and J.A. Group of Hospitals, Gwalior.

Study Duration

March 2024 – January 2025.

Sample Size

200 histopathological confirmed astrocytoma cases.

Inclusion Criteria

- Histopathological diagnosed astrocytomas.
- Adequate tissue sections and records.

Exclusion Criteria

- Incomplete pathology records.
- Recurrent tumors with unavailable primary diagnosis.

Data Collection

Data were retrieved from pathology archives and histopathology registers.

Variables studied:

- Age
- Gender
- Tumor location
- Histological subtype
- WHO grade

Statistical Analysis

Data were analyzed using SPSS version 26. Chi-square test was applied. A p-value <0.05 was considered statistically significant.

Results

Table 1. Age and Gender Distribution

Variable	Frequency	Percentage (%)	p-value
Male	118	59.0	
Female	82	41.0	0.018*
≤20 years	32	16.0	
21–30 years	40	20.0	
31–50 years	84	42.0	
>50 years	44	22.0	0.011*

Interpretation
Males predominated, and the majority of cases occurred between 31–50 years of age.

Table 2. Histopathological Spectrum

Histological Type	Frequency	Percentage (%)	p-value
Pilocytic Astrocytoma	28	14.0	
Diffuse Astrocytoma	68	34.0	
Anaplastic Astrocytoma	41	20.5	
Glioblastoma	63	31.5	0.001*

Interpretation
Diffuse astrocytoma was the most common subtype followed by glioblastoma

Table 3. WHO Grade Distribution

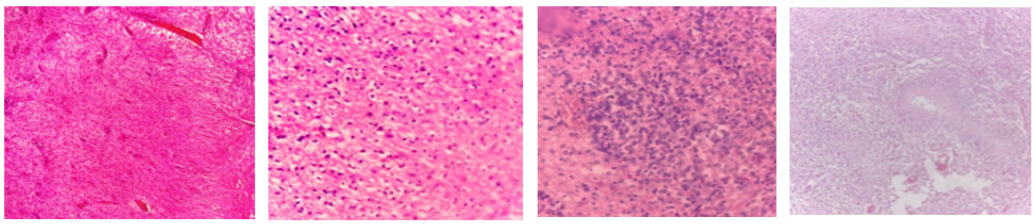
WHO Grade	Frequency	Percentage (%)	p-value
Grade I	28	14.0	
Grade II	68	34.0	
Grade III	41	20.5	
Grade IV	63	31.5	0.002*

Interpretation
Grade II tumors were most common, while Grade IV tumors represented nearly one-third of cases.

Table 4. Anatomical Distribution of Tumors

Location	Frequency	Percentage (%)	p-value
Frontal Lobe	73	36.5	
Temporal Lobe	42	21.0	
Parietal Lobe	31	15.5	
Occipital Lobe	18	9.0	
Cerebellum	21	10.5	
Others	15	7.5	0.006*

Interpretation
The frontal lobe was the most frequently involved anatomical location.



Grade 1 **Grade 2** **Grade 3** **Grade 4**

1. **Grade 1-**Initial tissue architecture
2. **Grade 2-**Dense inflammatory infiltrate
3. **Grade 3-**Persistent inflammatory response
4. **Grade 4-**Fibrocollagenous healing/fibrosis

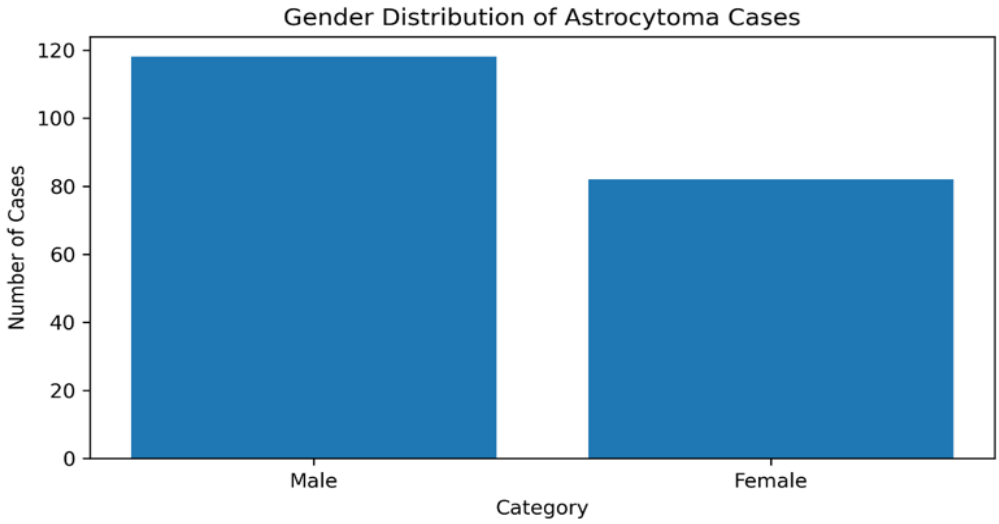


Figure 1: Gender distribution of astrocytoma cases

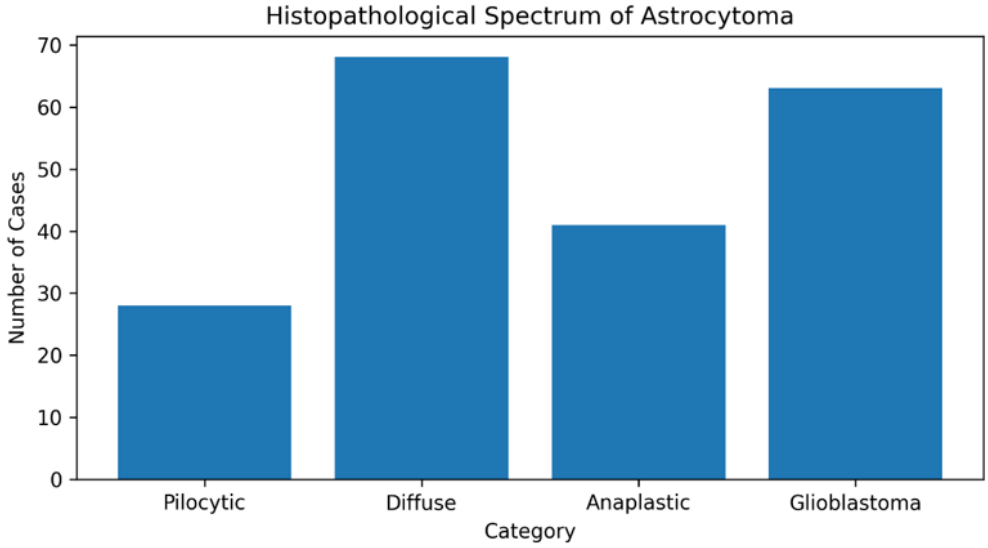


Figure 2: Histopathological spectrum of astrocytoma

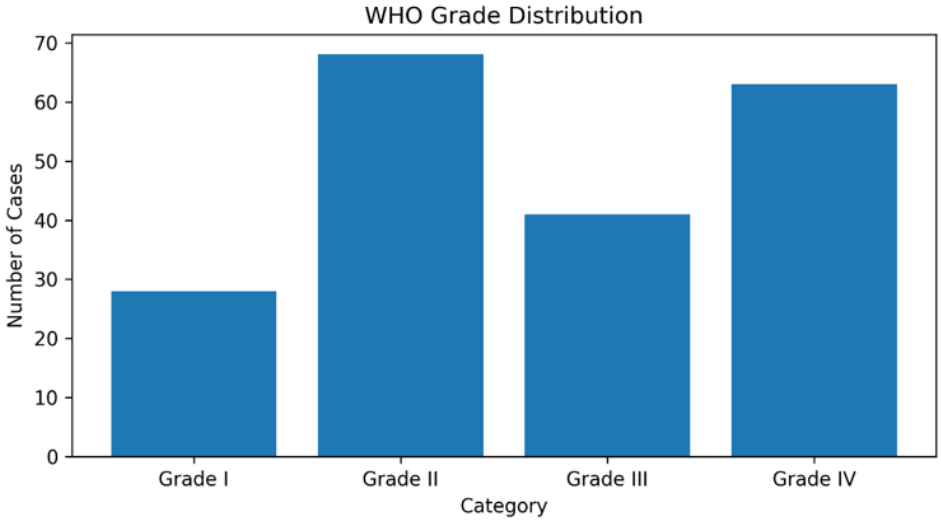


Figure 3: WHO grade distribution

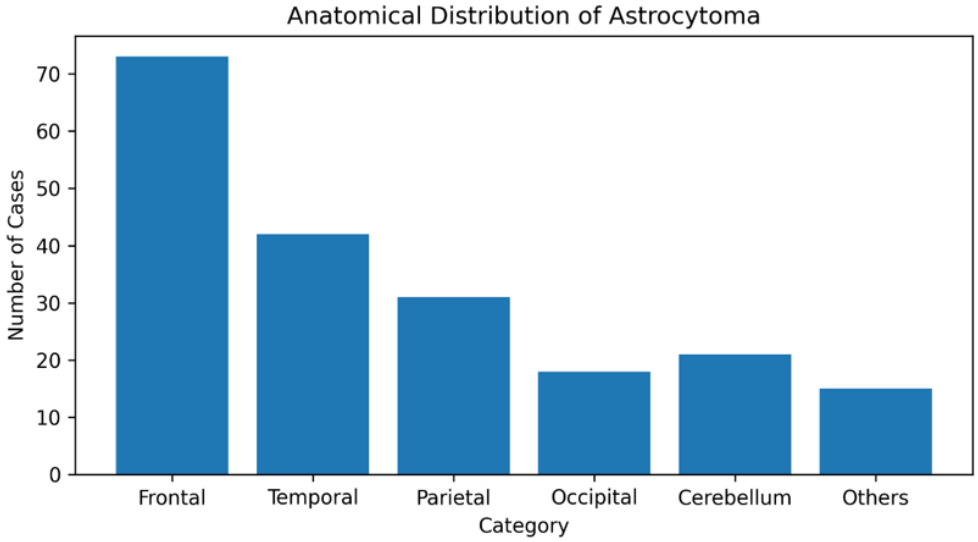


Figure 4: Anatomical distribution of astrocytoma

Discussion

The histological spectrum of astrocytomas diagnosed at J.A. Group of Hospitals, Gwalior, was assessed in the current retrospective study. Astrocytomas exhibit considerable variation in form, biological behaviour, and prognosis, and they continue to be among the most prevalent primary intracranial neoplasms. 59% of patients in the current study were male, indicating a male predominance. Numerous national and international investigations have revealed similar gender distributions. Although the causes of male predominance are still unknown, hormonal, genetic, and environmental factors may be involved [5].

Most of the patients were between the ages of 31 and 50. This result is in line with the known epidemiology of diffuse and high-grade astrocytomas, which typically strike middle-aged adults. The percentage of paediatric cases was lower, and pilocytic astrocytomas were the most common type [6]. With 34% of cases, diffuse astrocytoma was found to be the most prevalent histological subtype. This finding is similar to a number of Indian studies that found diffuse astrocytoma to be the most common

low-grade astrocytic tumour. In comparison to higher-grade lesions, these tumours have a comparatively good prognosis and exhibit moderate cellularity and infiltrative development [7].

Glioblastoma was the second most prevalent subtype, accounting for 31.5% of cases. Glioblastoma continues to be one of the most dangerous human cancers despite advancements in treatment. The significant burden of high-grade gliomas in clinical practice is highlighted by their high frequency in the current study [8]. Nearly one-third of cases were Grade IV tumours, but WHO Grade II tumours made up the largest grading category. Significantly, older patients were more likely to have higher-grade lesions. This correlation most likely reflects the accumulation of molecular changes and the progressive malignant transformation that comes with growing older [9].

The most frequently affected anatomical site was the frontal lobe. Previous neuro-oncology research has revealed similar findings. Astrocytic neoplasms may be more common in this area due to the frontal lobes comparatively large volume and numerous white matter tracts [10]. Despite the growing focus on molecular diagnoses, histopathological inspection is still essential. Important details on tumour grade, cellular shape, mitotic activity, necrosis, and microvascular proliferation are still obtained through microscopic examination. Histopathology continues to be the predominant diagnostic method in many settings with limited resources [11].

This study's comparatively large sample size and thorough evaluation of clinical and demographic factors are among its strong points. Its retrospective nature and lack of molecular classification data, which are increasingly included in contemporary WHO CNS tumour classifications, are among its drawbacks. Overall, the study shows that diffuse astrocytoma and glioblastoma are more common in the local population and stresses the ongoing significance of histological assessment in the diagnosis of brain tumours [12].

Conclusion

An overview of the histological range of astrocytomas diagnosed at J.A. Group of Hospitals, Gwalior, is given in this retrospective study. Given the wide biological variability of astrocytic neoplasms, diffuse astrocytoma and glioblastoma were the most prevalent tumour subtypes. The bulk of occurrences happened in the fourth and fifth decades of life, and there was a notable male predominance. The most commonly affected anatomical area was found to be the frontal lobe. Although a significant percentage of patients had high-grade lesions, especially glioblastoma, WHO Grade II tumours were the most prevalent.

The importance of age as a prognostic factor was highlighted by the study, which showed a substantial correlation between growing older and greater tumour grade. Astrocytoma diagnosis and classification still heavily rely on histopathological examination, especially in situations where molecular testing might not be widely accessible. The results provide useful geographical information about astrocytoma patterns and could help pathologists, neurosurgeons, and doctors comprehend the spread of disease in the community. It is advised that future research use molecular markers and long-term monitoring to improve prognostic evaluation and classification. The thorough assessment of astrocytic tumours will continue to heavily rely on histopathology in conjunction with contemporary molecular diagnostics.

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