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ORIGINAL ARTICLE

A clinicopathological study on IDH (Isocitrate Dehyrogenase) wild type gliomas.

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ABSTRACT… Objective: To describe the clinicopathological profile of IDH-wildtype gliomas and evaluate their association with age and sex. **Study Design:** Descriptive Cross-sectional study. **Setting:** Department of Histopathology, Shaukat Khanum Memorial Hospital and Research Centre, Lahore. **Period:** December 16, 2023 till June 16, 2024. **Methods:** A total of 73 IDH-wildtype glioma patients were included. The IDH1 (R132H) immunohistochemistry was performed to identify cases, and was confirmed by molecular testing when clinically indicated. Data from clinical, radiologic, histopathological, molecular, and treatment records were obtained from the hospital records. The diagnosis of the tumors was made by histological diagnosis and based on the 2007 WHO Classification of Central Nervous System Tumors. Data was analysed with SPSS version 26. The clinicopathological features were compared among the age groups and sex by Chi-square test or Fisher's exact test, p-value of <0.05 was regarded as significant. **Results:** The mean age was 39.45 ± 12.45 years, and 67.1% of patients were male. The most common location of the tumor was the right frontal lobe (37.0%). The most common histological subtype identified was glioma not otherwise specified (52.1%) and 58.9% of the tumors were WHO Grade III or IV. The most common radiological impression was high-grade glioma (47.9%) while surgery combined with chemoradiotherapy was the most common treatment (60.3%). There was a significant association between WHO grade (p<0.001) and radiological impression (p=0.002) and age, in that older patients had higher proportion of Grade IV tumors and high-grade radiological features. No differences were found between age and tumor location, histological subtype, tumor size or treatment modality. Likewise, there were no significant differences between gender with respect to clinicopathological parameters. **Conclusion:** IDH-wildtype gliomas were primarily in middle-aged men, and often were high-grade tumors of the frontal lobe. Tumour aggressiveness was significantly correlated with increasing age, but not significant for sex. The results help to define the clinicopathological spectrum of IDH-wildtype gliomas and can help to refine the process of diagnostic stratification as well as future prognosis research.

Key words: Astrocytoma, Glioblastoma, Glioma, Histopathology, IDH-wildtype, Molecular Pathology, World Health Organization Classification.

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INTRODUCTION

Glioblastoma, IDH-wildtype is diagnosed using an integrated histological and molecular approach, according to the 2021 WHO Classification of Central Nervous System Tumours.[1] Diffuse astrocytic IDH-wildtype tumors that do not have the typical histological features of glioblastoma could also be diagnosed as glioblastoma if they had a TERT promoter mutation, EGFR amplification or a combination of whole chromosome 7 gain and whole chromosome 10 loss (+7/–10).[2] Wildtype isocitrate dehydrogenase (IDH) glioblastoma is the most aggressive primary brain tumor in adults, having one of the poorest prognosis among all cancers.[3] Multimodal treatment; radiotherapy, surgical intervention and various types of pharmacotherapy; has a median overall survival of approximately 12 months at population level.[4]

IDH-wildtype glioblastomas are mostly diagnosed in elderly adults, predominantly in males, and are associated with a progressive age-dependent increase in incidence with an exponential pattern after 40 years of age.[5] Histological features such as curvilinear capillary proliferation and pseudopalisading necrosis frequently occur in IDH-wildtype high-grade tumors, and correlate directly with suspicious high-grade features seen on preoperative imaging.[6]

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The patients tend to present acutely with large primary tumor size, which is typically >3–5 cm, and a significant peritumoral edema, due to their rapid biological growth.[6] IDH-wildtype glioblastomas typically involve multiple cerebral lobes and are also well known to occur in the subcortical white matter of the frontal and temporal lobes.[7] Focal neurological deficit and general performance status have been determined as important clinical predictors of survival in patients with glioblastoma with IDH status wild type who receive surgical resection.[8]

Contradicting data from major multicenter series: real-world cohorts have a significant variety of clinical outcomes, and IDH-wildtype central trial guidelines assume an aggressively poor prognosis for all IDH-wildtype malignancies. Berzero et al. (2021) challenged the notion that all IDH-wildtype lesions were the same as main Grade 4 glioblastoma, with a median OS of 59-88 months in patients with IDH-wildtype histological Grade II gliomas.[9] Likewise, in a large-scale study of 647 patients in the Chinese Glioma Genome Atlas (CGGA) Hou et al. (2025) found that classical microscopic grade is still an independent prognosticator of overall survival, independent of molecular status or the extent of surgical resection.[10] This discrepancy is also present in preoperative neuroimaging. Recent Heidelberg University Hospital cohort study (2025) identified 12.5% of IDH-wildtype glioblastomas, which had a significantly longer median survival than IDH mutant glioblastomas (27.2 vs. 14.7 months) and exhibited low-grade radiological features (lack of contrast enhancement) and no classical histological necrosis.[11]

Therefore, although gliomas have been molecularly classified, there are still some points to be clarified in real clinical settings in relation to the clinicopathological spectrum of IDH-wildtype gliomas. The majority of the available evidence comes from high income countries and there is limited data available from South Asia countries especially Pakistan. Thus, this study was designed to define clinicopathological features of IDH-wildtype gliomas and examine its correlations with demographic features in patients treated at a tertiary care cancer center.

METHODS

The study was a descriptive cross-sectional study carried out in the department of Histopathology of Shaukat Khanum Hospital and Research Centre Lahore, which was reviewed and approved formally by IRB and Ethics Committee (SKMCH&RC IRB EX-04-06-26-01, dated 01.07.26) The study was done during December 16, 2023 till June 16, 2024. IDH-wildtype gliomas diagnosed in the patient on pathological examination were also included in the study. The immunohistochemistry (IHC) of these gliomas was negative for IDH.[12]

The formula for the single-population proportion was used to determine the sample size. In the previous literature, the percentage for IDH-wildtype glioblastomas was reported as about 95 %. The sample size calculated was 73 cases 12 for a 95% confidence level, a 5% level of significance and an absolute precision equal to 5% taking the proportion expected of 95%. All patients with formalin-fixed paraffin-embedded (FFPE) tissue blocks that were diagnosed with glioma from 2021 to 2025 were included. Data regarding age, sex, tumor location, radiological impression, treatment received and molecular findings were obtained from the hospital medical records.

Molecular testing (IDH PCR) was undertaken based on availability of tissue and clinical indication, as was further testing (pTERT and BRAF V600E mutation). To determine tumor type and grade, hematoxylin and eosin (H&E) stained slides were evaluated histopathologicaly following the WHO Classification of Central Nervous System Tumors. Representative sections of tissue were stained with isocitrate dehydrogenase-1 (IDH1 R132H) by immunohistochemistry (IHC). Gliomas with IDH1 immunoreactivity that were negative were classified as IDH-wildtype gliomas. If clinically indicated, cases that were immunostained negatively for IDH1 (R132H) were subject to molecular testing to confirm IDH status.

Where necessary, additional markers were used to aid with the diagnosis, including p53 and ATRX. The study was approved by the Institutional Review Board of Shaukat Khanum Hospital and Research Centre. All procedures were performed

in compliance with institutional ethical guidelines and confidentiality of patient information was respected throughout the study. Inclusion criteria were: Diagnosis as adult patient (IDH-wildtype) by immunohistochemistry (IDH1 R132H), presence of formalin fixed paraffin embedded (FFPE) tissue samples and complete histopathological diagnosis. The exclusion criteria were the presence of pediatric cases (≤18 years), IDH-mutant status confirmed by immunohistochemistry and/or molecular testing, gliomas located in the midlines, patients with inadequate tissue and/or poor fixation and patients with incomplete clinical data, and patients diagnosed with non-glioma brain tumors and/or other central nervous system cancers.

The data were entered and analyzed by Statistical Package for Social Sciences (SPSS) version 26.0. All continuous variables such as age, largest tumor diameter and tumor width were tested for normality and then represented as mean ± standard deviation (SD) or median with interquartile range (IQR). The categorical variables such as sex, tumour location, histological diagnosis, WHO grade, molecular characteristics, radiological impression and treatment modality were given as frequencies and percentages. Chi-square test or Fisher's exact test was used to assess the association between clinicopathological characteristics with age group or sex depending on the availability. A two-tailed p-value of <0.05 was considered statistically significant.

RESULTS

A total of 73 patients were included. The mean age was 39.45 ± 12.45 years, with a median of 35 years (IQR: 30–49) and a range of 21–72 years. Most patients were male (67.1%). The mean largest tumor diameter was 5.35 ± 1.67 cm, while the mean tumor width was 4.24 ± 1.43 cm. The right frontal lobe was the most common tumor location (37.0%), followed by the left frontal lobe (23.3%) and right temporal lobe (16.4%). Most tumors measured 3–6 cm (63.0%), while 30.1% were larger than 6 cm and only 6.8% were 3 cm or smaller. Glioma, NOS was the most frequent histological diagnosis (52.1%), followed by glioblastoma (26.0%) and astrocytoma (21.9%).

Grade II tumors accounted for 41.1% of cases, Grade III for 19.2%, and Grade IV for 39.7%. Overall, 58.9% of patients had Grade III or IV tumors. IDH PCR was positive in 23 patients (31.5%) and negative in 22 (30.1%), while testing was not performed in 28 patients (38.4%). The 1p/19q alteration was detected in 4 cases (5.5%) and not detected in 14 (19.2%); however, testing was not performed in 55 cases (75.3%). pTERT was negative in two cases, while it was not assessed in 97.3% of patients. Radiologically, high-grade glioma was the most frequent impression (47.9%), followed by low-grade glioma (38.4%). Surgery combined with chemotherapy and radiotherapy was the most commonly used treatment approach (60.3%), followed by chemotherapy with radiotherapy (26.0%) and surgery with radiotherapy (13.7%).

WHO grade differed significantly across age groups (p<0.001). Grade II tumors were more common among patients aged 21–40 years (54.2%), whereas Grade IV tumors predominated among patients aged 41–60 years (73.7%) and were present in all patients older than 60 years. Radiological impression was also significantly associated with age group (p=0.002). Low-grade glioma was the most frequent radiological impression among patients aged 21–40 years (50.0%), whereas high-grade glioma was reported in 78.9% of patients aged 41–60 years and all patients older than 60 years.

No statistically significant associations were observed between age group and tumor location (p=0.129), histological diagnosis (p=0.443), tumor size (p=0.153), or treatment modality (p=0.769). Although right frontal tumors and tumors larger than 6 cm appeared proportionally more frequent among patients older than 60 years, these differences were not statistically significant. None of the evaluated clinicopathological characteristics differed significantly by sex. Tumor location (p=0.278), histological diagnosis (p=0.443), WHO grade (p=0.836), IDH PCR status (p=0.721), tumor size (p=0.779), radiological impression (p=0.337), and treatment modality (p=0.907) were similarly distributed between males and females. High-grade radiological findings were reported in 46.9% of males and 50.0% of females, while Grade IV tumors were observed in 40.8% and 37.5%, respectively.

TABLE-I

Demographic and clinicopathological characteristics of patients with IDH-Wildtype Gliomas (n = 73)

Variable	Result
Age (years)	39.45 ± 12.45
Median (IQR)	35.0 (30.0–49.0)
Range	21–72
Largest tumor diameter (cm)	5.35 ± 1.67
Tumor width (cm)	4.24 ± 1.43
Sex	
Male	49 (67.1)
Female	24 (32.9)
Tumor location	
Right frontal lobe	27 (37.0)
Left frontal lobe	17 (23.3)
Right temporal lobe	12 (16.4)
Left temporal lobe	6 (8.2)
Left parietal lobe	6 (8.2)
Right parietal lobe	4 (5.5)
Right insula	1 (1.4)
Tumor size category	
≤3 cm	5 (6.8)
3–6 cm	46 (63.0)
>6 cm	22 (30.1)

Data are presented as mean ± SD or n (%).

TABLE-II

Histopathological, molecular and treatment characteristics (n = 73)

	Variable	n (%)
Histological diagnosis	Glioma, NOS	38 (52.1)
	Glioblastoma	19 (26.0)
	Astrocytoma	16 (21.9)
Grades	Grade II	30 (41.1)
	Grade III	14 (19.2)
	Grade IV	29 (39.7)
IDH PCR	Positive	23 (31.5)
	Negative	22 (30.1)
	Not performed	28 (38.4)
1p/19q FISH	Detected	4 (5.5)
	Not detected	14 (19.2)
	Not performed	55 (75.3)
pTERT	Negative	2 (2.7)
	Not performed	71 (97.3)
Radiological impression	Low-grade glioma	28 (38.4)
	Low-to-intermediate grade	5 (6.8)
	Intermediate-grade glioma	5 (6.8)
	High-grade glioma	35 (47.9)
Treatment	Surgery + Chemotherapy + Radiotherapy	44 (60.3)
	Chemotherapy + Radiotherapy	19 (26.0)
	Surgery + Radiotherapy	10 (13.7)

DISCUSSION

Gliomas are the most common primary tumors of the CNS with an estimated incidence of 6.6 per 100,000 persons in the USA annually.[13] As per the latest research, the new estimated number of brain and CNS cancers globally in 2022 is 322,000. Africa had lower rates than the other areas, which had the highest rates, Eastern Asia (3.95 per 100,000), Western Europe (5.56 per 100,000) and Northern America (5.46 per 100,000).[14] These variations in incidences are indicative of the underlying problem of under diagnosis and underreporting in LMICs that affects policymaking and allocation of resources to treat gliomas.

The present study described the clinicopathological and molecular characteristics of persons with IDH-wildtype gliomas and indicated a significant association between old age and higher grade and more aggressive radiological features, not sex. Most patients were young to middle aged, had advanced grade illness, frontal lobe involvement, and were larger in size with a male predominance. Males made up 67.1% of the group, with a mean age of 39.45 ± 12.45 years. Although the mean age is somewhat younger than that reported by other groups, the inclusion of IDH-wildtype diffuse gliomas (IDH-wildtype DGs) of WHO grade II–IV instead of glioblastoma, and regional referral patterns, may explain this. The younger age of our cohort (39.5 years) is very similar to that of Asian tertiary series for glioblastoma (Ochirjav et al., 39 ± 17 years; Meel et al., 43.5 years).[15,16] These baseline results indicate regional demographic differences and the importance of evaluating genetic markers as well as age-specific clinical presentations.

TABLE-III

Association of clinicopathological characteristics with age group (n = 73)

Variable	21–40 years (n=48)	41–60 years (n=19)	>60 years (n=6)	P-Value
Tumor location				
Left frontal lobe	15 (31.3)	2 (10.5)	0 (0.0)	
Left parietal lobe	5 (10.4)	1 (5.3)	0 (0.0)	
Left temporal lobe	1 (2.1)	4 (21.1)	1 (16.7)	
Right insula	1 (2.1)	0 (0.0)	0 (0.0)	0.129
Right parietal lobe	3 (6.3)	1 (5.3)	0 (0.0)	
Right frontal lobe	15 (31.3)	7 (36.8)	5 (83.3)	
Right temporal lobe	8 (16.7)	4 (21.1)	0 (0.0)	
Histological diagnosis				
Astrocytoma	9 (18.8)	6 (31.6)	1 (16.7)	
Glioblastoma	11 (22.9)	5 (26.3)	3 (50.0)	0.443
Glioma, NOS	28 (58.3)	8 (42.1)	2 (33.3)	
WHO grade				
Grade II	26 (54.2)	4 (21.1)	0 (0.0)	
Grade III	13 (27.1)	1 (5.3)	0 (0.0)	<0.001
Grade IV	9 (18.8)	14 (73.7)	6 (100.0)	
Tumor size				
≤3 cm	5 (10.4)	0 (0.0)	0 (0.0)	
3–6 cm	30 (62.5)	14 (73.7)	2 (33.3)	0.153
>6 cm	13 (27.1)	5 (26.3)	4 (66.7)	
Radiological impression				
Low-grade glioma	24 (50.0)	4 (21.1)	0 (0.0)	
Low/intermediate	10 (20.8)	0 (0.0)	0 (0.0)	0.002
High-grade glioma	14 (29.2)	15 (78.9)	6 (100.0)	
Treatment				
Chemo + RT	12 (25.0)	5 (26.3)	2 (33.3)	
Surgery + Chemo + RT	28 (58.3)	13 (68.4)	3 (50.0)	0.769
Surgery + RT	8 (16.7)	1 (5.3)	1 (16.7)	

This gender difference has been consistently reported in the past, and males account for 55-65% of patients with IDH-wildtype gliomas. In a multicenter series of IDH-wildtype glioma WHO grade 4, Keric et al. reported an average age of 58 years and a male predominance of 63.1%.[17] Similarly, Lee et al. observed a male predominance in patients with IDH-wildtype diffuse astrocytic tumors. The ~2:1 male to female ratio is consistent with prospective glioma studies and with worldwide neuro-oncology registries, where a male bias has been consistently shown throughout diffuse astrocytic tumors resulting from the genetic and microenvironmental vulnerability of males.[18]

Most lesions in our study sample were tumors of the frontal lobe, most commonly in the right frontal lobe (37.0%). This is consistent with previous large scale spatial mapping studies, by Li et al. (990 cases), which revealed a strong preference of frontal lobes for diffuse gliomas, which correlates with the area's rich long-associated fiber architecture and large volume of white matter.[19] Also, spatial frequency mapping investigations by Bao et al. (2023) confirmed that there was a right hemisphere bias and a strong structural affinity for frontotemporal white matter in the presence of a non-random distribution of high-grade gliomas.[20]

TABLE-IV

Association of clinicopathological characteristics with sex (n = 73)

Variable	Male (n=49)	Female (n=24)	P-Value
Tumor location			
Left frontal lobe	11 (22.4)	6 (25.0)	0.278
Left parietal lobe	4 (8.2)	2 (8.3)	
Left temporal lobe	5 (10.2)	1 (4.2)	
Right insula	1 (2.0)	0 (0.0)	
Right parietal lobe	4 (8.2)	0 (0.0)	
Right frontal lobe	14 (28.6)	13 (54.2)	
Right temporal lobe	10 (20.4)	2 (8.3)	
Histological diagnosis			
Astrocytoma	10 (20.4)	6 (25.0)	0.443
Glioblastoma	15 (30.6)	4 (16.7)	
Glioma, NOS	24 (49.0)	14 (58.3)	
WHO grade			
Grade II	19 (38.8)	11 (45.8)	0.836
Grade III	10 (20.4)	4 (16.7)	
Grade IV	20 (40.8)	9 (37.5)	
IDH PCR			
Positive	14 (28.6)	9 (37.5)	0.721
Negative	15 (30.6)	7 (29.2)	
Not done	20 (40.8)	8 (33.3)	
Tumor size			
≤3 cm	4 (8.2)	1 (4.2)	0.779
3–6 cm	31 (63.3)	15 (62.5)	
>6 cm	14 (28.6)	8 (33.3)	
Radiological impression			
Low-grade glioma	17 (34.7)	11 (45.8)	0.337
Low/intermediate	4 (8.2)	1 (4.2)	
Intermediate-grade glioma	5 (10.2)	0 (0.0)	
High-grade glioma	23 (46.9)	12 (50.0)	
Treatment			
Chemo + RT	12 (24.5)	7 (29.2)	0.907
Surgery + Chemo + RT	30 (61.2)	14 (58.3)	
Surgery + RT	7 (14.3)	3 (12.5)	

Many of the people in our study had relatively large tumors (more than 6 cm at diagnosis), while around one 3rd of the tumors were greater than this. Majority of tumors (63.0%) had a size range of 3-6 cm. According to the Swedish registry, the most common tumor sizes were 4-6 cm (46.1%), smaller than 4 cm (38.5%) and larger than 6 cm (12.5%). In both studies, the majority of IDH-wildtype gliomas at diagnosis are intermediate size tumors, although there are some differences in the definitions of tumor sizes.[21]

Almost 50% of the tumors in our group were classified as gliomas, NOS. This high percentage of NOS

diagnosis closely mirrors the real-world challenges encountered in low and middle income countries (LMICs) to implement the WHO classification of tumors of the central nervous system (CNS) from the year 2021.[22] Similar findings are reported in a recent retrospective analysis of the impact of WHO classification on the diagnosis of glioma carried out at a high-volume neurosurgical center in Latin America. The percentages of tumors that were not fully characterised was higher in 2021: 24% of cases were high or low grade glioma, NOS, as a result of limited access to required molecular investigations.[23] The greater percentage of Glioma, NOS found in our study as compared to the Latin American cohort could be the result of our institution's more restricted access to molecular testing. The CONCORD-3 investigators also observed substantial variation in the classification of the brain tumors across the world, with countries with fewer diagnostic facilities having higher proportions of not otherwise specified (NOS).[24]

One of the key findings of the study was the lack of molecular diagnostics for 38.4% of patients, 75.3% lacking IDH PCR, 75.3% lacking 1p/19q testing, and 97.3% lacking pTERT analysis. The results are consistent with the survey Goyal et al. conducted across Africo-Asian region where 64.8% of the clinicians stated that financial constraints are a major challenge in implementing the WHO 2021 classification and more than 70% of the clinicians stated that they faced difficulties in accessing the molecular diagnostic facilities. Although the 2021 classification placed integrated histopathological and molecular diagnosis as an emphasis, its full implementation is still restricted due to the lack of molecular testing in low resource area. These geographical difficulties are probably reflected in our cohort's high percentage of incomplete molecular profiling, which might account for the comparatively high prevalence of Glioma, NOS diagnoses seen in our study.[22]

Most patients were found to have physiologically aggressive diseases with approximately 58.9% of patients having Grade III and IV tumors. The recent results of large retrospective studies including analysis of 647 patients with IDH-wildtype glioma from the Chinese Glioma Genome Atlas (CGGA) lend strong backing to this high-grade predominance. The CGGA research yielded similar focus on physiologically aggressive disease, and importantly, showed that high histopathological grade was an independent, poor prognosis factor for overall and progression-free survival, regardless of surgical extent or whether there was an adjuvant treatment. Taken together, these results suggest that the underlying histopathological grade is an important indicator of disease severity and is still an important clinical indicator of aggressive biological activity in IDH-wildtype tumors, while the WHO 2021 framework strongly emphasizes molecular diagnostic criteria.[10]

In present study, radiologically, the most frequent preoperative impression was that of a high-grade glioma (47.9%) and this was highly associated with the pathological findings, with high percentage of grade III–IV tumors. The results are consistent with that of Shukla et al., which suggested a high sensitivity of preoperative MRI (76–89%) and specificity (86–96%) in differentiating between low-grade and high-grade gliomas, and showed a high prediction rate of the grade of glioma by preoperative MRI (85.2%).[25]

In line with the current conventional multimodal care for high-grade diffuse gliomas, which is still the chosen treatment option for the majority of IDH-wildtype high-grade gliomas, the majority of patients (60.3%) got combination surgery, chemotherapy, and radiation. The area analysis also revealed that combination multimodal therapy was associated with significantly improved overall and progression-free survival in both IDH-wildtype glioblastoma and IDH-mutant astrocytoma. As both cohorts were treated with multimodal therapy, which is the current standard of care for diffuse gliomas, it was not the aim of our investigation to assess survival.[26]

The strong association between age and the aggressiveness of the tumor was one of our most important findings. The proportions of Grade IV tumours and high-grade radiological appearances were significantly increased in older patient's ≥ 41 years when compared with younger patients. They also demonstrated that the WHO grade was significantly related to age and the high-grade

radiological appearance ($p<0.001$ and $p=0.002$, respectively). A recent statewide Swedish registry research of 1,458 patients with pathologically proven IDH-wildtype glioblastoma, which likewise found a strong correlation between aging and worse disease outcomes, supports these conclusions.[21]

In contrast, in our cohort, gender was not a significant factor in tumor location, WHO grade, molecular profile, radiological findings or treatment modality. Gliomas also tend to form in males, but a few recent studies have also found that gender subsequently has minimal impact on pathological grade or molecular type after the tumor has formed. The findings indicate that although male sex may be a risk factor for glioma, the severity of the disease seems to be linked more with molecular changes and age of patients than to biological sex.

Overall, our study confirms the evidence that age can be an important clinicopathological factor for tumor aggressiveness in IDH wildtype gliomas, while sex does not play a significant role in tumor characteristics. The study also underscores the importance of broad adoption of complete molecular analysis to allow for correct classification of gliomas according to the WHO classification and personalized management of patients with glioma.

LIMITATIONS

There are some limitations of this study. First, it took place at one tertiary care center, and due to the relatively small sample size, the study results may not be representative. Secondly, its retrospective cross sectional design was dependent on the completeness of medical records, and missing data was a risk. Third, the availability of tissue samples and clinical indication for molecular investigation prohibited comprehensive molecular classification in all patients, and molecular investigations were not performed in all patients, such as IDH PCR, 1p/19q co-deletion analysis, pTERT and BRAF mutation testing. In addition, survival outcome, recurrence, progression-free survival, and treatment response were not assessed due to the cross-sectional design. Lastly, there was no multivariate analysis to determine independent predictors of high-grade disease.

CONCLUSION

In our cohort, IDH-wildtype gliomas were more common in males, and were mainly found as high-grade tumors. Higher WHO grade and high grade radiological features were significantly correlated with the increasing age while the gender was not. The results suggest that IDH-wildtype gliomas are highly aggressive tumors and emphasize the need for thorough histopathological and molecular characterization for proper diagnosis and management of the patient.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Shingruff Ishtiaq:** Study design, drafting.
2	**Sajid Mushtaq:** Acquisition of data.
3	**Safana Sadaf:** Data analysis, interpretation of data.