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Effective Primary Brain Tumor Management in aRural Setup

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ABSTRACT:
Background: Primary Brain tumours are among the most common malignant diseases globally, ranking 19th in new cases according to GLOBOCAN 2022. These tumors are genetically diverse with increasing incidence and mortality rates. Treatment typically includes maximal safe resection and adjuvant therapy, with radiation therapy crucial for both malignant and benign CNS tumors.
Purpose: This study aims to analyse brain tumor types and examine treatment protocols and outcomes at the institution to improve early diagnosis and treatment.
Methods: The study included patients with primary brain tumors treated at DBVP Rural Medical College, Maharashtra, from June 2022 to May 2024. Patients were classified according to the WHO CNS5 classification, with treatment plans based on tumor type, surgical extent, and Karnofsky Performance Score (KPS). Treatment included observation, neurosurgery, adjuvant radiation therapy (RT), chemo-radiotherapy (CTRT), or chemotherapy followed by RT. Patients were monitored for radiation toxicities using RTOG and chemotherapy toxicity using CTCAE version 5. Response evaluation was done at 1.5, 3, and 6 months using RANO criteria.
Results: Among 39 patients with primary brain tumors, the majority were aged 41-50, with a male-to-female ratio of 1.6:1. Most had a KPS of 80. The most common diagnosis was Glioblastoma Multiforme (38.46%). All patients primarily underwent craniotomy, with partial resection being the most common type of resection.
Further, 30 patients underwent adjuvant radiation therapy with or without chemotherapy. The treatment intent was curative in 93.54% of cases, with combined chemo-radiotherapy most common treatment modality (54.83%). Most received radiotherapy with the 3DCRT technique at 60Gy in 30 fractions.
At the last follow-up, 20% had stable disease, 40% achieved a complete response, 10% had progressive disease, and 10% had a partial response. Additionally, 20% had expired. CTRT for high-grade gliomas resulted in a 31.58% complete response rate, while RT alone for low-grade gliomas had a 54.55% complete response rate.
Overall, of the 30 patients receiving RT with or without chemotherapy, 80% of patients were alive, and 20% had expired at the last follow-up.
Conclusion: Overall, the data reflects a trend towards improved disease management, with an increasing number of patients showing complete or partial responses and a reduction in progressive disease. This indicates that radiation therapy with or without concurrent chemotherapy effectively controls disease progression for a significant portion of the patient population, with a majority of patients (80%) still alive, highlighting the positive impact of the treatment on survival.

Keywords: Primary Brain Tumors, Glioblastoma Multiforme, Gliomas, Radiotherapy, Chemo-radiation therapy

I. INTRODUCTION:

Brain tumors are among the most prevalent malignant diseases worldwide, ranking 19th and 14th in India for new cases diagnosed as per Global Cancer Observatory, GLOBOCAN 2022.[1] Worldwide, 3,21,731 new cases of brain cancer were recorded in 2022: it was diagnosed in 1,73,699 (54%) males and 1,48,032 (46%) females. The highest incidence, mortality, and prevalence were observed in Asia followed by Europe as per GLOBOCAN 2022.[1] In 2022, the total number of deaths from brain cancer worldwide was 2,48,500.[1] Brain tumors are rare and diverse in terms of their genetics and biology. The age-specific incidence of

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CNS tumors reveals a striking double peak: an initial surge during childhood, predominantly between ages 3 and 12, and a second peak later in life, affecting those between 50 and 80 years old.[2] Gliomas account for more than 70% of all the brain tumors, of which, glioblastoma is the most common and malignant histology (WHO grade IV).[3]

The presentation and clinical outcomes of these tumors differ based on factors such as age, histology, and location within the central nervous system. Brain tumors can cause symptoms and signs through local brain invasion, compression of neighbouring structures, and elevated intracranial pressure (ICP). Diagnosing brain tumors typically starts with imaging studies such as contrast-enhanced MRI, which provides detailed views of the tumor location, size, and characteristics.[4] Confirmation of the diagnosis involves a biopsy or surgical resection, followed by histopathological examination to determine the tumor type, grade, and molecular features, which are crucial for treatment planning and prognosis prediction.[5]

Maximal safe surgical resection is attempted to remove as much tumor tissue as possible without causing neurological deficits.[6] Radiation therapy and chemotherapy are used as adjuvant treatments to target any remaining tumor and prevent progression or recurrence. [7]

As we delve deeper into the molecular underpinnings and clinical characteristics of primary brain tumors, it becomes increasingly clear that a multidisciplinary approach is essential. Advances in imaging, surgical techniques, and adjuvant therapies are continuously evolving, offering hope for improved disease outcomes and quality of life for patients.

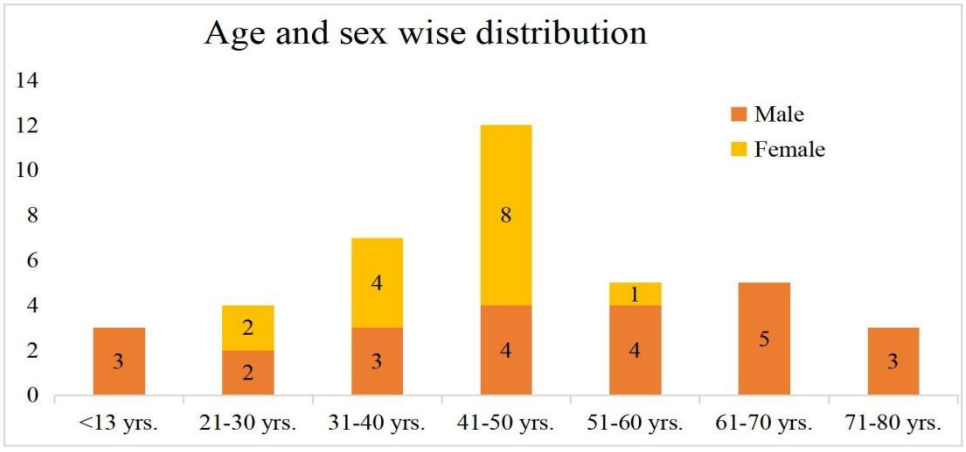
II. METHODOLOGY:

After IEC approval, this single institute, descriptive, longitudinal observational study was conducted at DBVPRMC in Maharashtra from June 2022 to May 2024, focusing on patients diagnosed with primary brain tumors. Patients were classified according to the WHO CNS5 classification, and treatment plans were tailored based on tumor type, extent of surgery, and Karnofsky Performance Score (KPS). Treatments included observation, neurosurgery, adjuvant radiation therapy (RT), adjuvant chemo-radiotherapy (CTRT), or adjuvant chemotherapy followed by RT. Patients were monitored for radiation toxicities using RTOG criteria and chemotherapy toxicities using CTCAE version 5. Response evaluation was conducted at 1.5, 3, and 6 months using RANO criteria. All data collected underwent straightforward statistical analysis.

III. RESULTS:

The study found that primary brain tumors accounted for 2.42% of all cancer patients in the department. Most patients were adults. The mean age at diagnosis was 45 years, with a male-to-female ratio of 1.6. Details are illustrated in Graph 1.Histopathological analysis revealed Glioblastoma Multiforme WHO Grade 4 (15,38.46%) as the most prevalent diagnosis in the rural setup.

Graph 1: Age and sex distribution



1. **Tumor family as per WHO CNS 5**: Among the 39 patients included in the study, the predominant diagnoses according to WHO CNS5 were gliomas, glioneuronal tumors, and neuronal tumors, collectively accounting for approximately 79.49% of the cases. Individual cases of pineal tumors, cranial and paraspinal nerve tumors, and meningiomas each comprised about 2.56% of the cases.

International Journal Dental and Medical Sciences Research
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Haematolymphoid tumors, including various types of lymphomas, were identified in 3 patients (7.69%), and tumors of the sellar region, such as pituitary adenomas and other sellar masses, were diagnosed in 2 patients (5.13%). The most common tumor subtype was Adult Type Diffuse Glioma, making up 66.67% of the cases. Other tumor types, including Circumscribed Astrocytic Glioma, Meningioma, Pineal Tumor, Glioneuronal and Neuronal Tumor, Schwannoma, Ependymoma, and Tumors of the Sellar Region, accounted for the remaining cases, each representing 2.56% to 5.12% of the total. Lymphomas represented 7.69% of the cases, with a higher prevalence in individuals aged 41-80.

Analysis as per subtype, grade, molecular characteristic, and age group: In a detailed breakdown of tumor subtypes and their associated molecular characteristics, Glioblastoma Multiforme (WHO Grade 4) was the most prevalent tumor subtype seen in 18 patients, especially with the immunohistochemistry-proven IDH wildtype characteristic, observed across all age groups, with a notable concentration in individuals aged 41-50. Further details of other diagnoses are mentioned in Table 1.

Tumor Subtype	WHO Grade	Molecular Characteristic	Age Group	Number of Cases
Astrocytoma	Grade 2	IDH mutant	21-30	1
Astrocytoma	Grade 3	IDH mutant	31-40	1
Astrocytoma	Grade 3	NOS	41-50	1
Astrocytoma	Grade 3	NOS	51-60	1
Astrocytoma	Grade 3	NOS	61-70	1
Central Neurocytoma	Grade 2		<13	1
Craniopharyngioma			31-40	1
Diffuse Midline Glioma	Grade 4	H3K27M altered	21-30	1
Glioblastoma Multiforme	Grade 4	IDH wild-type	<13	1
Glioblastoma Multiforme	Grade 4	IDH wild-type	21-30	1
Glioblastoma Multiforme	Grade 4	DH wild-type	31-40	3
Glioblastoma Multiforme	Grade 4	IDH wild-type	41-50	5
Glioblastoma Multiforme	Grade 4	IDH wild-type	51-60	2
Glioblastoma Multiforme	Grade 4	IDH wild-type	61-70	3
Glioblastoma Multiforme	Grade 4	NOS	61-70	1
Glioblastoma Multiforme	Grade 4	IDH wild-type	71-80	1
Glioblastoma Multiforme	Grade 4	NOS	71-80	1
Lymphoma		NOS	41-50	1
Lymphoma		NOS	71-80	1
Meningioma	Grade 2		31-40	1
Oligodendroglioma	Grade 3	NOS	31-40	1
Oligodendroglioma	Grade 3	NOS	51-60	1
Pilocytic Astrocytoma	Grade 1	NOS	<13	1
Pineal Gland Tumor	Grade 2		41-50	1
Pituitary Adenoma			41-50	1
Pleomorphic Xanthoastrocytoma	Grade 2	NOS	41-50	1
Primary Diffuse B-Cell Lymphoma of CNS		CD20, BCL2,BCL6,MUM1,C-MYCPOSITIVE	51-60	1
Schwannoma			41-50	1
SupratentorialEpendymoma	Grade 3	NOS	21-30	1
SupratentorialEpendymoma	Grade 3	NOS	41-50	1
Total			39	

Table 1: Analysis as per subtype, grade, molecular characteristic and age group.

International Journal Dental and Medical Sciences Research
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2. **Management of Primary Brain Tumor:** In the cohort study, all 39 patients (100%) underwent craniotomy for primary brain tumor excision, confirmed via histopathology. Partial resection was the most common procedure, performed on 18 patients (46.15%), followed by biopsy (9 patients, 23.08%), complete resection (7 patients, 17.95%), and subtotal resection (5 patients, 12.82%).

Out of the 39 patients with primary brain tumors, 31 (79.48%) received further treatment at the department. Treatment modalities included adjuvant chemo-radiation therapy (n=18, 58.06%), adjuvant radiation therapy alone (n=12, 31.70%), and adjuvant chemotherapy (n=1, 3.2%). Four patients with diagnoses including Pilocytic Astrocytoma (WHO Grade 1), Meningioma (WHO Grade 2), Central Neurocytoma (WHO Grade 2), and Schwannoma opted for complete tumor resection followed by active follow-up, while four patients declined further treatment.

Adjuvant Radiation Therapy: 30 patients (96.77%) were treated with adjuvant radiation therapy. The most common interval between surgery and radiotherapy was within 4 weeks for 9 patients (30%).

Most treatments in this study group were intended to be curative (28, 93.33%). 17 received adjuvant chemo-radiation therapy; 11 received adjuvant radiation therapy only (53.84%), and 1 received adjuvant chemotherapy only (3.2%). For palliative intent, one case received adjuvant chemo-radiation therapy, and another received adjuvant radiation therapy.

Radiation therapy prescription dose: For curative-intent radiation therapy, Conventional Radical Treatment was given to a total dose of 54-60 Gy in 28-33 fractions, 1.8-2 Gy per fraction using 3D Conformal Radiation Therapy (3DCRT) in 89.28% of patients and Intensity-Modulated Radiation Therapy (IMRT) in rest. 2 patients diagnosed with Glioblastoma Multiforme (WHO Grade 4) were treated with palliative intent, one underwent concurrent CTRT and the other received radiation therapy alone.

In the palliative setting, patients were treated to a total dose of 28-39 Gy in 10-13 fractions, 2.8- 3 Gy per fraction using the 3DCRT technique.

Details are mentioned in Table 2.

Table 2: RADIATION THERAPY PRESCRIPTION DOSE:

Intent	Total dose/No of Fraction	Dose (Gy) per Fraction	Cases	Percentage of cases (%)	Percentage of intent (%)
Curative	60Gy/30#	2	23	76.68	93.33
	59.4Gy/33#	1.8	1	3.33	
	56Gy/28#	2	1	3.33	
	54Gy/30#	1.8	3	10.00	
Palliative	28Gy/10#	2.8	1	3.33	6.67
	39Gy/13#	3	1	3.33	
Total			30	100	100

Treatment toxicity assessment: For patients receiving radiation therapy with concurrent TMZ administration (CTRT) with curative intent, RTOG Grade 1 acute radiation-induced skin toxicity in all patients. RTOG Grade 1 acute neurological toxicity was reported in 73.33% of patients and Grade 2 in 26.67%. All patients experienced chemotherapy-induced nausea, Grade 1 as per CTCAE and 1 patient experienced Grade 1 chemotherapy-induced photo-sensitivity. None experienced any chemotherapy-inducedhaematological toxicity. Late neurological toxicity RTOG Grade 2 and Grade 3 were observed in patients receiving CTRT.

All patients treated with radiation therapy alone with curative intent experienced Grade 1 radiation-

International Journal Dental and Medical Sciences Research
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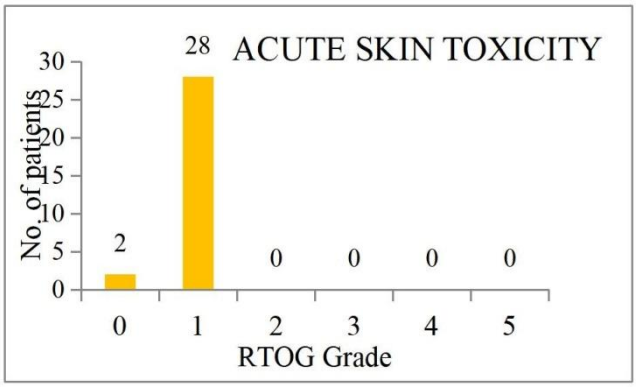
induced skin toxicity and showed symptomatic improvement during follow-up.

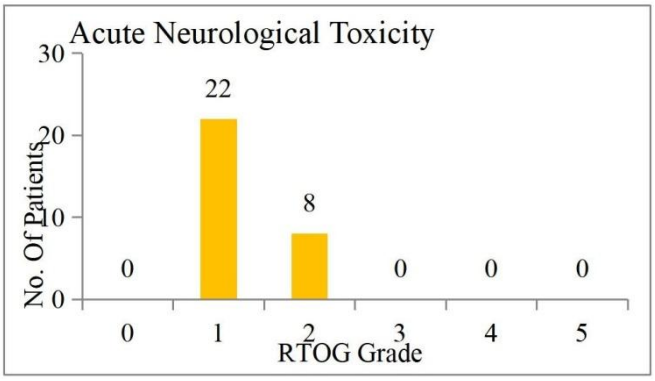
No treatment-associated toxicity was seen in the palliative setting.
Details are illustrated in Graphs 2, 3, and 4.

RADIATION THERAPY TOXICITY:

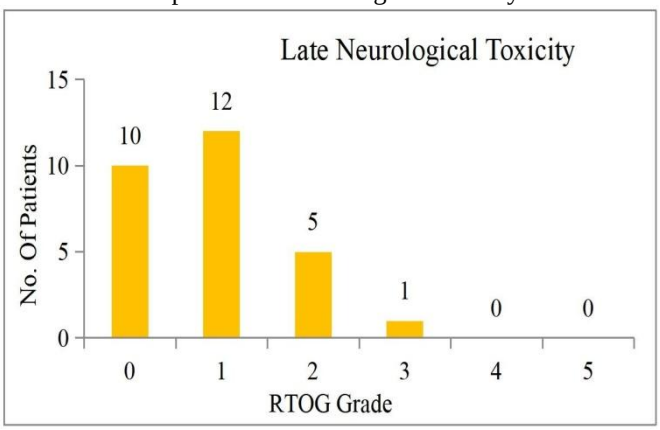
Graph 2: Acute Skin Toxicity



Graph 3: Acute Neurological Toxicity:



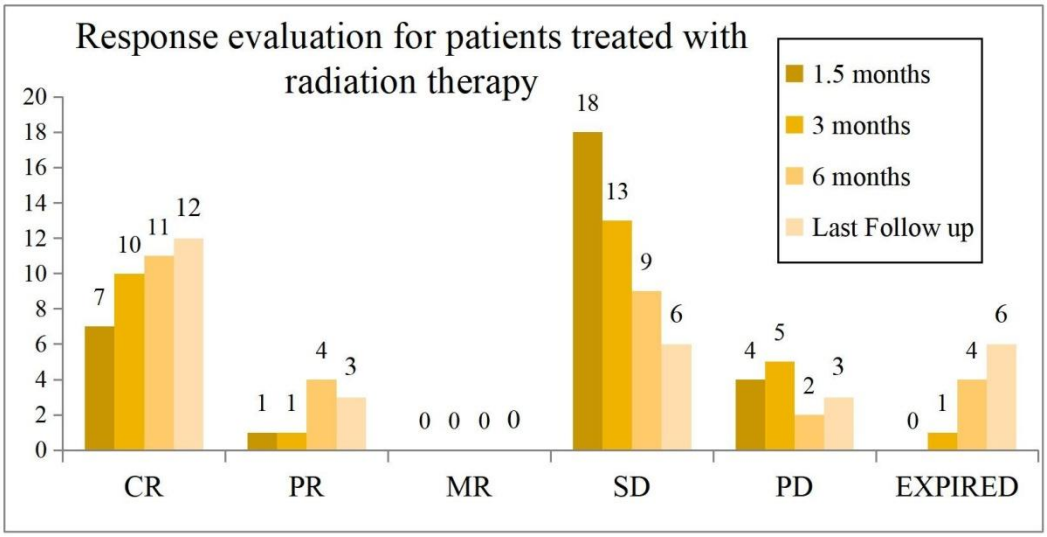
Graph 4: Late Neurological Toxicity:



Details of response evaluation of patients treated with Radiation Therapy: The response of primary brain tumor patients to treatment varied significantly over different time intervals, details mentioned in Graph 5.

International Journal Dental and Medical Sciences Research
Volume 6, Issue 3, May - June 2024 pp 418-426 www.ijdmsrjournal.com ISSN: 2582-6018

Graph 5: Response evaluation for patients treated with radiation therapy:



In patients with high-grade gliomas (HGG) treated with chemo-radiation therapy

(CTRT), 31.58% achieved complete response (CR), 10.53% had partial response (PR), 15.79% had stable disease (SD), 15.79% showed progressive disease (PD), and 26.32% died. In patients with low-grade gliomas (LGG) and symptomatic benign primary brain tumors treated with radiation therapy (RT) alone, 54.55% achieved complete response, 9.09% had partial response, 27.27% had stable disease, and no cases of progressive disease were reported.

At the last follow-up, patients receiving chemo-radiation therapy (CTRT) for high-grade gliomas (HGG) had a CR rate of 31.58%, with 15.79% experiencing PD and 26.32% mortality. In contrast, those treated with radiation therapy (RT) alone for low-grade gliomas (LGG) and symptomatic benign tumors achieved a higher CR rate of 54.55%, with no reported cases of PD.

IV. DISCUSSION:

In India, as per **GLOBOCAN 2022**, CNS malignancy is the 14th most common malignancy with an incidence of 2.3%.[1] Total, 39 (2.42%) patients presented with biopsy-proven primary brain tumor. This incidence is lower than the global statistics for CNS tumors reported by GLOBOCAN 2022 but aligns with the GLOBOCAN 2022 statistics for India.[1] Of the 39 patients, 24 (61.53%) were male, and 15 (38.46%) were female, resulting in a male-to-female ratio of 1.6. A retrospective epidemiology study conducted in Northeast India by **Barua et al.** reported the highest age distribution in the sixth decade, followed by the fifth decade, with a male predominance and a male-to-female ratio of 1.4.[8]

The study provided a detailed analysis of tumor subtypes, classified by diagnosis, WHO grade, and molecular characteristics. Glioblastoma Multiforme (GBM), IDH wild-type, WHO Grade 4, was the most common and aggressive tumor, prevalent across all ages but especially among those aged 41-50. Followed by Astrocytoma, ranging from WHO Grade 2 to Grade 3, which showed a varied age distribution. Grade 2 IDH mutant Astrocytoma were found in individuals aged 21-30, while Grade 3 Astrocytoma, both IDH mutant and NOS, appeared in ages 31-70, indicating diverse clinical and molecular profiles. Oligodendroglioma, mostly WHO Grade 3 and NOS, was common in the 31-60 age group. Lymphomas, particularly Primary Diffuse B Cell Lymphoma of the CNS, were more prevalent in older adults (41-80), with a peak in the 51-60 age group.

Diffuse Midline Glioma (WHO Grade 4) with H3K27M alteration was primarily found in individuals aged 21-30 although it is mentioned in the paediatric diffuse glioma category as per **WHO CNS5**.[9]

Meningioma (WHO Grade 2) was prevalent in the 31-40 age group, and Pilocytic Astrocytoma (WHO Grade 1) is typically seen in children under 13. Tumors like Pineal Gland Tumor, Pituitary Adenoma, Pleomorphic Xanthoastrocytoma, and Schwannoma were common in the 41-50 age group, indicating middle-aged susceptibility. Supratentorial Ependymoma (WHO Grade 3 and NOS) occurred in both 21-30 and 41-50 age groups, marking its diverse age distribution.

Paul et al. similarly noted that glioblastoma multiforme was the most common histological subtype, representing 30% of cases, with Grade II

and Grade III astrocytoma also being significant, each accounting for 15% of cases.[10]

In contrast to the distribution of tumor types, **Barua et al.** revealed a spectrum of tumor types, with meningiomas representing the largest share at 24%, followed by gliomas, nerve tumors, and tumors of the sellar region.[8] Notably, no haematolymphoid tumor cases were observed during their study period. **Meel et al.** found meningiomas, glioblastoma multiforme, and germ cell tumors as the most common and highlighted astrocytoma as the most common tumor in the paediatric population.[11]

All patients underwent primary surgical excision, with partial resection being the most common procedure (18, 46.15%). Study by **Chaichan et al**found that achieving atleast 70% extent of resection and reducing residual tumor volume to less than 5 cm^3 is significantly associated with improved survival and lower recurrence rates in glioblastoma patients, providing valuable guidelines for optimizing surgical outcomes.[12]

Out of the 39 patients, 31 (79.48%) received further treatment: adjuvant chemo-radiation therapy (18,58.06%), radiation therapy alone (12, 31.70%), and chemotherapy (1, 3.2%). Most (28, 93.33%) received curative treatment, with 6.67% receiving palliative care. Four patients, with Pilocytic Astrocytoma (WHO Grade 1), Meningioma (WHO Grade 2), Central Neurocytoma (WHO Grade 2), and Schwannoma, were advised to have complete resection and follow-up. Another four declined further treatment.

In the study, 30 patients (96.77%) received radiation therapy. Of these, 18 (60%) underwent concurrent chemotherapy with T. Temozolamide (TMZ), 17 with curative intent and 1 with palliative intent. The remaining 12 patients (40%) received radiation therapy alone, 11 with curative intent and 1 with palliative intent.

Most patients (9, 30%) began radiotherapy within 4 weeks of surgery. Additionally, 8 patients (26.66%) started radiotherapy after more than 8 weeks and another 8 (26.66%) within 4.1-6 weeks post-surgery. A smaller group of 5 patients (16.66%) had a 6.1-8 week gap between surgery and radiotherapy. No clinical correlation was found between the timing of radiotherapy post-surgery and disease outcomes.

Curative Treatment: A total of 28 patients were treated with curative intent; 17 (60.71%) received Chemo-Radiation Therapy (CTRT), and 11 (39.28%) received radiation therapy alone.

A) Chemo-Radiation Therapy (CTRT) Details: 17 patients treated with curative intent, diagnosed with high-grade gliomas—including Glioblastoma Multiforme IDH wildtype (WHO Grade 4), Astrocytoma IDH mutant (WHO Grade 3), Oligodendroglioma (WHO Grade 3 NOS), and Diffuse Midline Glioma WHO Grade 4 (H3K27M altered)—received CTRT. The prescribed radiation therapy dose was 59.4-60 Gy, delivered in 30-33 fractions with 1.8-2 Gy per fraction. This was administered using 3D Conformal Radiation Therapy (3DCRT) in 16 patients and Intensity-Modulated Radiation Therapy (IMRT) in 1 patient.

All patients received TMZ at a dose of 75 mg/m^2 daily throughout the radiation therapy course. Sixteen patients completed the concurrent chemotherapy course, while one patient could only complete 15 days of treatment due to personal reasons. All patients experienced Grade 1 acute radiation-induced skin toxicity. Additionally, 7

(41.17%) of the 17 patients receiving CTRT experienced Grade 2 acute neurological toxicity. Grade 1 TMZ-induced nausea was reported by all patients, and one patient experienced TMZ-induced photo-sensitivity in the third week of TMZ administration. No cases of chemotherapy-inducedhaematological toxicity were reported.

Following the initial treatment, 16 (94.11%) patients proceeded to receive six cycles of maintenance TMZ at 150-200 mg/m^2, while one patient did not complete the planned maintenance cycles.

Jalali et al used a similar protocol to treat GBM patients. Patients underwent maximal resection followed by radiotherapy and TMZ, with 74% completing six cycles of adjuvant TMZ. Treatment was well tolerated, with minimal severe adverse effects. The regimen was found to prolong survival in GBM patients.[13]

B) RT Alone Details: 11 patients diagnosed with Pineal gland tumor WHO Grade 2, Supratentorial Ependymoma WHO Grade 3, Pituitary Adenoma, Pleomorphic Xanthoastrocytoma, Astrocytoma IDH mutant WHO Grade 2, symptomatic Craniopharyngioma, and two patients initially diagnosed with Oligodendroglioma WHO Grade 2 and Astrocytoma WHO Grade 2 (later confirmed as Glioblastoma Multiforme IDH wildtype WHO Grade 4) were treated with radiation therapy alone.

The radiation therapy dose ranged from 54-60 Gy, delivered in 28-30 fractions with 1.8-2 Gy per fraction using 3DCRT or IMRT. IMRT was used for 2 patients with Pineal gland tumor WHO Grade 2 and Craniopharyngioma. All patients experienced Grade 1 skin toxicity, and one (9.09%) had Grade 2 acute neurological toxicity.

During follow-up, 7 (63.63%) patients showed symptomatic improvement, while 4

International Journal Dental and Medical Sciences Research
Volume 6, Issue 3, May - June 2024 pp 418-426 www.ijdmsrjournal.com ISSN: 2582-6018

(36.36%) reported Grade 1 late radiation-induced neurotoxicity.

Dağdelen et al. recommend active follow-up for all low-grade glioma patients, with surgery followed by adjuvant radiotherapy upon progression, and emphasize that high-risk patients should routinely receive postoperative RT, with treatment decisions made through a multidisciplinary evaluation.[14]

Palliative Treatment: Two patients (6.67%) were treated with palliative intent; one received CTRT and one received RT alone. Both were diagnosed with Glioblastoma Multiforme IDH wild type WHO Grade 4.The patient with multifocal disease and KPS 70 received CTRT with a radiation dose of 39 Gy in 13 fractions (3 Gy per fraction) using the 3DCRT technique and concurrent T. TMZ. The patient with KPS 40 received radiation alone with a dose of 28 Gy in 10 fractions (2.8 Gy per fraction) using the 3DCRT technique. Neither patient reported any acute radiation-induced toxicity.

Gupta et al. suggest that short-course radiotherapy is as effective as conventional radiotherapy for survival and palliation in poor prognosis patients. Current prognosis systems are inadequate, highlighting the need for quality-of-life-focused trials. Until then, standard care for poor prognosis high-grade gliomas (HGG) is maximum safe resection followed by short-course radiotherapy.[15]

Treatment Toxicity:In the study, most patients experienced acute radiotherapy toxicities which were mild, with 93.33% experiencing Grade 1 skin reactions and 73.33% having Grade 1 neurological symptoms. More severe reactions (Grades 2 and above) were rare or absent in both skin and neurological domains, indicating a generally manageable and favourable safety profile for the radiotherapy protocols employed. All patients in both CTRT and RT alone groups had Grade 1 skin toxicity. However, Grade 2 acute neurological toxicity was more common in the CTRT group (41.17%) compared to the RT alone group (9.09%). This indicates that while skin toxicity was similar, CTRT increased the risk of acute neurological toxicity.

Anand et al studied the neurotoxicity in patients with HGG who were treated with conformal postoperative radiation and TMZ results in low-grade MRI-assessed neurotoxicity and cognitive disturbance in HGG patients, without adverse impacts on local control and survival.[16]

Response evaluation in patients who underwent radiation therapy: The response of primary brain tumor patients to treatment showed varying outcomes over different time intervals. Initially, at 1.5 months, a majority exhibited stable disease (60%), with notable percentages achieving complete response (23.33%) and some showing progressive disease (13.33%). Over time, at 3 months and 6 months, the proportion of patients with stable disease decreased, while those achieving complete response increased. However, progressive disease rates fluctuated and partial responses remained consistent but low.

By the last follow-up, stable disease was observed in 20% of patients, with 40% achieving complete response. Progressive disease and partial response each affected 10% of patients, and 20% had expired. This suggests a trend towards improved responses initially, followed by stabilization or progression in some cases.

In patients with high-grade gliomas (HGG) treated with chemoradiotherapy (CTRT), 31.58% achieved complete response (CR), 10.53% had partial response (PR), 15.79% had stable disease (SD), 15.79% showed progressive disease (PD), and 26.32% died. In contrast, among patients with low-grade gliomas (LGG) and symptomatic benign primary brain tumors treated with radiotherapy (RT) alone, 54.55% achieved CR, 9.09% had PR, 27.27% had SD, and no cases of PD were reported. The significant differences in response between these groups highlight that, while HGG patients treated with CTRT had mixed outcomes with notable CR and PD rates and significant mortality, LGG and symptomatic benign tumor patients treated with RT alone experienced higher CR and SD rates with no PD and death.

Anand et al.'s findings that conformal radiation and TMZ offer a modest extension of life expectancy with manageable neurotoxicity in high-grade glioma patients over a year.[16]**Jalali et al**.'s study reported 1- and 2-year survival rates of 67% and 29% respectively, and median overall and progression-free survival times of 16.4 and 14.9 months in glioblastoma multiforme patients treated with concomitant TMZ and RT.[13]Additionally, **Liu et al.** demonstrated that high-dose radiotherapy (>54 Gy) significantly improves survival in low-grade glioma patients with O_6-methylguanine-DNA methyltransferase promoter nonmethylation.[17]

In the cohort of 30 patients undergoing radiotherapy, with or without concomitant chemotherapy, it was observed that 80% of the patients were alive, while 20% had succumbed at the time of the last follow-up, indicating a more favourable disease outcome for patients who received adjuvant treatment.

V. CONCLUSION:

The research provides a comprehensive analysis of primary brain tumors in a rural Indian cohort, revealing insights into the incidence of

various types of primary brain tumors, their treatment options, and their outcomes. The findings align with global and regional epidemiological data, highlighting the predominance of certain tumor types across different age groups. Glioblastoma multiforme (GBM) emerged as the most prevalent and aggressive subtype, particularly affecting individuals in their fifth and sixth decades of life.

Treatment outcomes marked the efficacy of current therapeutic modalities, with significant proportions of patients benefiting from adjuvant chemo-radiation therapy and adjuvant radiotherapy alone. The management approach, guided by maximum safe resection followed by tailored radiotherapy protocols, reflects current best clinical practice.

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