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DEMOGRAPHIC PROFILE AND RESPONSE EVALUATION OF GLIOBLASTOMA MULTIFORME IN A CANCER INSTITUTE OF NORTH -WEST INDIA

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ABSTRACT

Background & Objectives-

Glioblastoma multiforme (GBM) is the most common CNS neoplasm worldwide .The aim of this study is to identify the demographics and response evaluation in the patients of GBM ,diagnosed between the year 2015-2022 in a cancer institute of Punjab in North West India and determine its significance, while comparing results with national and international standards.

Materials and Methods-

Demographic data of patients of GBM who underwent treatment at our institute between the year 2015-2022 was obtained retrospectively and comparative evaluation of MRI findings pre and post - treatment after 6-8 weeks was done, which was followed by response evaluation with the Revised RECIST guideline (version 1.1).

Results-

A total of 82 patients (44 males; mean age 45.61±15.96 years and 38 females; mean age 46.07±15.14)were diagnosed with GBM over the period of 2015 to 2022 .The incidence is highest amongst the age group 41-50 years in males (14.63%) and 31-40 years in females (17%).Out of 82 patients ,16 patients (19.51%) achieved a Complete Response (CR) ,47 patients (57.32%) achieved

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a Partial Response(PR),14 patients(17.07%) had a Progressive disease(PD) and 5 patients(6.10%) had a Stable Disease(SD). Complete Response was higher in females(13.41%) than males(6.10%).
Conclusions-
The present study on the demographic profile of GBM patients in a cancer institute of Punjab in North West India between the year 2015-2022 produced overall incidence higher in males (54%) and in the age group (41-50years in males) and (31-40 years in females) which is a decade earlier than found in international studies ,while being at par with previous studies conducted in India.
Keywords- Glioblastoma multiforme , Demographics , Response evaluation , CNS neoplasm , North West India

INTRODUCTION

Glioblastoma multiforme (GBM) is the most commonly occurring malignant primary brain tumor. Primary brain tumors(Gliomas) are identified by the cells of their origin which include Astrocytic tumors (astrocytoma, anaplastic astrocytoma and glioblastoma), Oligodendrogliomas, ependymomas, and mixed gliomas.GBM represents 77%-81% of all primary malignant tumors of the CNS [1].

The incidence of GBM varies from 3.20 -4.64 individuals per 100,000 inhabitants in the analysed reports worldwide .The incidence is fairly constant worldwide with peak incidence between 45 and 70 years. The median survival of glioblastoma patients is ~12 months.[2]

Glioblastoma can rarely present as hereditary tumour syndrome, e.g. Turcot's syndrome or Li–Fraumeni syndrome, whereas most cases have a sporadic origin which involves exogenous factors such as smoking, diet, radiation, socioeconomic status and education level, immunological status allergy and viral infections.[3]

The most common genetic alterations in GBM are EGFR gene amplification, loss of tumor suppressors gene PTEN on chromosome 10, p53 on chromosome 17 and TP53 mutation.[4]

In this retrospective study conducted on GBM patients diagnosed between the year 2015 and 2022 at a cancer institute of Punjab in North West India, we intend to identify the demographic profile and response evaluation to treatment and determine its significance, while comparing the results with national and international standards.

MATERIALS & METHODS

In this study ,data was recovered retrospectively by electronic and physical records from the patients diagnosed with GBM between the year 2015-2022 at a cancer institute of Punjab in North-West India. A total of 82 patients were identified who underwent treatment at our institute which mainly included maximum possible surgical resection of the tumour followed by histopathological confirmation. Pre- treatment determination of the size of the tumour by radiological evaluation was done through MRI brain. Patients underwent radiation therapy followed by concurrent chemotherapy with Temozolomide .Demographic data included age, gender and treatment parameters which involved the extent of surgical resection ,dose and duration of radiotherapy and

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use of chemotherapy .Comparative evaluation of the size of the tumour was done with MRI brain before and after the administeration the standard therapy ,that is after 6-8 weeks of treatment initiation. Response evaluation was done with the Revised RECIST guideline (version 1.1)

STATISTICAL ANALYSIS-

1. DEMOGRAPHIC PROFILE OF THE PATIENTS- Comparative evaluation of the demographic profile of the patients was done .Data was obtained from a total of 82 patients who were diagnosed with Glioblastoma Multiforme between the year 2015-2022 at our institute and who underwent conventional tri-modal therapy .The following below (Table 1) is the incidence of GBM at our institute and its age and sex distribution

Age group (years)						
	Female		Male		Total	
	No.	%age	No.	%age	No.	%age
<20	1	1.22	3	3.66	4	4.88
21-30	4	4.88	7	8.54	11	13.41
31-40	14	17.07	3	3.66	17	20.73
41-50	3	3.66	12	14.63	15	18.29
51-60	10	12.20	11	13.41	21	25.61
61-70	6	7.32	8	9.76	14	17.07
Total	38	46.34	44	53.66	82	100.00
Mean age	46.07±15.14		45.61±15.96		45.82±15.49	

2.

(Table 1)

2. RESPONSE EVALUATION- All GBM patients underwent standard tri-modal therapy, including tumor excision that is maximum safe surgical resection, followed by radiation therapy and concurrent Temozolomide chemotherapy.The response evaluation to treatment was done before and after 6weeks of standard conventional therapy by comparative evaluation of the size of the lesions.Response to treatment was evaluated using the Revised RECIST Criteria (Version1.1).(Table 2&3) below depict the response to the conventional therapy in 82 patients who underwent treatment at our institute in the year 2015-2022 in terms of age and sex distribution respectively.

Age group	Response									
	CR		PD		PR		SD		Total	
	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age
<20	2	2.44	1	1.22	1	1.22	0	0.00	4	4.88
21-30	2	2.44	2	2.44	7	8.54	0	0.00	11	13.41
31-40	7	8.54	1	1.22	9	10.98	0	0.00	17	20.73
41-50	1	1.22	4	4.88	8	9.76	2	2.44	15	18.29
51-60	2	2.44	5	6.10	11	13.41	3	3.66	21	25.61
61-70	2	2.44	1	1.22	11	13.41	0	0.00	14	17.07
Total	16	19.51	14	17.07	47	57.32	5	6.10	82	100.00

(Table 2)

(Abbreviations: CR=Complete Response, PR=Partial Response, PD=Progressive Disease, SD=Stable Disease)

Response	Sex					
	Female		Male		Total	
	No.	%age	No.	%age	No.	%age
CR	11	13.41	5	6.10	16	19.51
PD	7	8.54	7	8.54	14	17.07
PR	18	21.95	29	35.37	47	57.32
SD	2	2.44	3	3.66	5	6.10
Total	38	46.34	44	53.66	82	100.00

(Table3)

RESULTS-

(A) A data of total 82 patients is obtained amongst which 44 (54%) are males and 38(46%) are females.

(B) The age of the patients ranged between 16years to 70years.

(C) The mean age of presentation is 45.61±15.96 years in males and 46.07±15.14 years in females.

(D) The incidence is highest amongst the age group bracket of 41-50years in males(14.63%) and 31-40 years in females (17%).

(E) Out of 82 patients ,16 patients (19.51%) achieved a Complete Response (CR) ,47 patients (57.32%) achieved a Partial Response(PR), 14 patients(17.07%) had a Progressive disease(PD) and 5 patients(6.10%) had a Stable Disease(SD).

(F) Complete Response was higher in females(13.41%) than males(6.10%).

(G) Complete Response was maximum in the age group of 31-40years (8.54%).

(H) Maximum number of patients achieved a Partial Response (57%) with the standard treatment.

DISCUSSION

Glioblastoma multiforme (GBM) is the most common CNS neoplasm which comprises of a group of morphologically heterogeneous neoplasms. The cellular composition can vary widely and mixed histologic features are seen. "Glioblastoma" is synonymous with WHO "Grade IV astrocytoma" in the previous WHO classification[5] .

MRI is the standard imaging modality to define lesion boundaries including size, shape, and location of the tumors. The current standard of care for GBM is excision followed by combination radiotherapy and chemotherapy.Standard external beam radiation therapy includes six weeks of localized radiation therapy five times per week.Gamma knife therapy delivers stereotactic high doses of radiation that confine treatment to the targeted GBM area.The current standard for chemotherapy for GBM is Temozolomide. Concurrent Temozolomide and radiotherapy increased median survival rates to 26.5% at 24 months, a vast improvement over the 10.4% with radiotherapy alone.[6]

It has been reported that the incidence of Glioblastoma is dependant upon geographic location, race and ethnicity. Incidence is two to three times more common among the Caucasian than the black populations.[7] One study reported higher incidence in Caucasians living in industrial areas.[8] Overall access to health care is one of the factors contributing to the regional differences in tumour incidence. Genetic variability across the race and ethnic groups may contribute to differences in the glioma incidence.[7]

Epidemiological reports describe the data depicting the possible influence of some anthropometric factors on the occurrence of GBM, especially in those who are male and elderly.A study conducted

by Cheo et al. stated that 83% of patients with GBM were over 50 years old, while Gosh et al. found most of the patients above the age of 60 years. In the study by Li et al.,47.9% of patients were aged >65years, with incidences peaking between 75 and 79 years of age.[9]

Incidence peak between 65 and 75 years of age with a male preponderance of GBM is described in study conducted in England with male to female ratio of 1.66 and 1.59 in US [10]

Central Brain Tumor Registry of the United States (CBTRUS) reports in 2013, 2017, and 2020, concluded that that the incidence of GBM increases with age, peaking at 75–84 years.The protective effects of female sex hormones on the development of GBM tumors might be contributory.[11]

Another study conducted in Singapore on 107 patients of GBM showed that incidence of GBM peaked in the 50-59 years .[12]

Interestingly the median age of glial tumors was seen to be at least a decade earlier in India than reported in the Western population, which could be partially explained by the lower life expectancy and a higher proportion of the younger population in India.[13]

In a prospective study for one-year on 656 patients of GBM from a single institute in Mumbai, Central part of India ,the median age was reported to be 50 yrs as compared to 62 yrs in developed countries.[14]

Another study enrolled 215 patients of GBM from 2005-2008 in New Delhi, Northern India ,which showed a median age of 48 years.[15]

In a study conducted in North East India, a total of 244 cases were enrolled amongst which 161 were males and 70 female patients with median age in males to be 34 years and 31.5 years in females.[16]

A retrospective evaluation of 143 patients from April 2006 to June 2015 in a single centre in South India showed the median age of 52 years ,with male to female ratio of 1.74:1.[17]

A single-institution study of 61 patients of GBM from 2012 to 2014 in Patna, Northern India, showed age of the patients ranged from 15 years to 68 years amongst which 44 were males and 17 were females, thus showing a male preponderance.[18]

Another study conducted from Jan 2014 to Dec 2018 in Srinagar ,North India ,enrolled 54 histopathologically proven cases of GBM with peak incidence in the fifth and sixth decade of life, and a male to female ratio of 2:1.[19]

CONCLUSION-

The present study on the demographic profile of GBM patients on 82 patients in a cancer institute of Punjab in North West India between the year 2015-2022, produced an overall incidence higher in males (54%) and in the age group (41-50years in males) and (31-40 years in females) which is a

decade earlier than found in international studies ,while being at par with previous studies conducted in India.

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