VOLUME-9, ISSUE-6, JUNE-2020 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Pathology

CLINICOPATHOLOGICAL ANALYSIS OF GLIOMAS - A SINGLE CENTER STUDY OF 263 CASES

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ABSTRACT

Introduction: CNS cancers affect both children and adult worldwide causing substantial morbidity and mortality. The most frequent primary malignant tumor of CNS is glioma. Gliomas are classified and graded histologically by WHO.

Aims and Objectives: To analyse the clinicopathological profile of gliomas in Madras Medical College in Chennai, Tamil Nadu, India.

Method: Data on age, sex, symptoms, radiological findings including CT and MRI, relevant investigations, per operative squash findings and gross findings, histologic subtype of all cases of gliomas diagnosed in Neuropathology department, Madras Medical College and Rajiv Gandhi Government General hospital, Chennai from January 2014 to December 2015 were obtained from clinicopathological documents. Histopathological slides were reviewed. Detailed clinical profile, radiological and pathological findings were analyzed.

Results: In this study period, out of 836 cases, 263 cases were gliomas. Significant correlations were found between age and sex, age and various subtypes of glioma, sex and subtypes of gliomas, subtypes and grade of gliomas, sex and different grades of gliomas.

Conclusion: In our study the peak incidence of gliomas observed was 41 -60 years. Gliomas show a male preponderance. Glioblastomamultiforme was the most common subtype and most of the Gliomas are WHO grade II followed by WHO grade IV tumors. This study presents diverse clinical and morphological spectrum of gliomas.

KEYWORDS : Gliomas, Glioblastomamultiforme.

INTRODUCTION

CNS tumors are rare neoplasms with 1-3% incidence [1]. The major milieu of primary brain tumors are derived from glial cells called gliomas. Gliomas are heterogenous group of neoplasms which include both low grade and high grade, and also showing diverse incidence, demographics, clinical presentation, histological subtypes and biological behavior. The effects of these tumors were devastating even though they constitute a small percentage of all cancers [2]. Hence according to Kurland and Schoenberg[3] there is an ultimate necessity for a descriptive data on primary brain tumors, hence this study is designed to get a descriptive data on gliomas over a period of two years.

MATERIALS AND METHODS

This was a retrospective study of a total of 263 glial tumor cases conducted in Department of Neuropathology, Madras Medical College and Rajiv Gandhi Government General hospital, during the period of January 2014 to December 2015. Relevant clinical details regarding age, sex, symptoms, CT and MRI findings, per operative squash findings and gross findings were obtained for all the cases of glioma from neuropathology registers and relevant investigations were collected from the medical records. Corresponding paraffin blocks were collected and histopathological sections were prepared in a glass slide from formalin fixed paraffin embedded tissue of resected specimens. They were subjected to H&E staining and histopathological slides were reviewed. IHC was done wherever necessary. The gliomas were classified and graded according to World Health Organization (WHO) of CNS neoplasms 2007. The clinical features, imaging findings, Squash findings were analyzed.

STATISTICAL ANALYSIS

The statistical analysis is performed using statistical package for social science software version IBM SPSS 20.

OBSERVATION AND RESULT

In this study period total of 836 cases have been reported in our institute of neuropathology, out of which 274 were non neoplastic, 562 were neoplastic. Among the neoplastic cases, 263 cases were gliomas, 137 cases were meningiomas and rest 162 were other neoplasms like, tumors of sellar origin, neuroectodermal tumors, germ cell neoplasms etc.

TABLE - 1
Age Wise Distribution ofGliomas

Age group	No of cases	Percentage
upto 20 years	60	22.8
21-40 years	79	30.0
41-60 Years	98	37.3
61-80 years	22	8.4
above 80 years	4	1.5
Total	263	100.0

TABLE – 2
Correlation of age Group with Sex of Gliomas

Age group		SEX		Total
		Male	Female	
Upto20 years	Cases	32	28	60
	%	19.0%	29.5%	22.8%
21-40 years	Cases	53	26	79
	%	31.5%	27.4%	30.0%
41-60 Years	Cases	65	33	98
	%	38.7%	34.7%	37.3%
61-80 years	Cases	14	8	22
	%	8.3%	8.4%	8.4%
above 80 years	Cases	4	0	4
	%	2.4%	0.0%	1.5%
Total	Cases	168	95	263
	%	100.0%	100.0%	100.0%

P=0.218.

Out of the 263 cases studied 63.9 % (168) of cases have occurred in males and 36.1 % (95) of cases have occurred in

females. In the present study, all glial tumors except oligoastrocytoma and ependymoma have male predilection and right side of brain was involved in 44.8% (118 cases), followed by left side 33.07% (87 cases), and other midline deep structures 22.05% (58 cases).

TABLE - 3
Distribution of Histological Subtypes of Gliomas

	Histological subtype	No. of cases	Percentage
1)	Pilocytic Astrocytoma	38	14.4
2)	Myxopapillary Ependymoma	2	.8
3)	Desmoplastic Astrocytoma	1	.4
4)	Gemistocytic Astrocytoma	1	.4
5)	Diffuse Fibrillary Astrocytoma	18	6.8
6)	Diffuse Astrocytoma	20	7.6
7)	Pleomorphic Xanthoastrocytoma	3	1.1
8)	Oligo Astrocytoma	5	1.9
9)	Oligodendroglioma	20	7.6
10)	Ganglioglioma	6	2.3
11)	Ependymoma	24	9.1
12)	Anaplastic Astrocytoma	21	8.0
13)	Anaplastic Oligodentroglioma	2	.8
14)	Anaplastic Oligoastrocytoma	2	.8
15)	Anaplastic Ependymoma	6	2.3
16)	Glioblastoma Multiforme	94	35.7
	Total	263	100.0

TABLE - 4
Site Wise Distribution of Gliomas

	Site	No of cases	Percentage
1.	Frontal	52	19.8
2.	Frontoparietal	23	8.7
3.	Fronto Temporal	13	4.9
4.	Temporal	30	11.4
5.	Temporoparietal	34	12.9
6.	Parietal	17	6.5
7.	Occipital	12	4.6
8.	Parietofrontal	2	.8
9.	Cerebellum.	7	2.7
10.	Cp Angle	2	.8
11.	Brain Stem	5	1.9
12.	Corpus Callosum	7	2.7
13.	Intraventricular	14	5.3
14.	Posterior Fossa	19	7.2
15.	Optic Nerve	1	.4
16.	Optic Chiasma	1	.4
17.	Basal Ganglia	7	2.7
18.	Suprasellar	3	1.1
19.	Extradural SOL	1	.4
20.	Intradural Intramedullary SOL	10	3.8
21.	Intradural extra medullary SOL	3	1.1
	Total	263	100.0

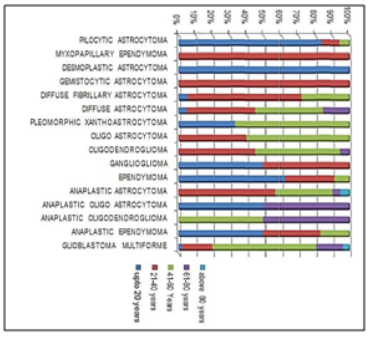

Figure 1:Correlation of subtypes of gliomas with age

263 cases of gliomas, were grouped according to WHO classification into four grades namely grade I - IV. In this study, 40 cases belong to grade I, 97 cases belong to grade II, 33 cases belong to grade III, and 93 cases belong to grade IV, constituting 15.2%, 36.9%, 12.5%, 35.4%respectively.

TABLE - 5
Correlation of Age and Grade of Gliomas

Age Group		WHOGrade				Total
		I	II	III	IV	
Upto20 years	Cases	32	22	4	2	60
	%	53.3%	36.7%	6.7%	3.3%	100.0%
21-40 years	Cases	6	40	16	17	79
	%	7.6%	50.6%	20.3%	21.5%	100.0%
41-60 Years	Cases	2	30	10	56	98
	%	2.0%	30.6%	10.2%	57.1%	100.0%
61-80 years	Cases	0	5	2	15	22
	%	0.0%	22.7%	9.1%	68.2%	100.0%
above80 years	Cases	0	0	1	3	4
	%	0.0%	0.0%	25.0%	75.0%	100.0%
Total	Cases	40	97	33	93	263
	%	15.2%	36.9%	12.5%	35.4%	100.0%

P<0.001*

TABLE - 6
Correlation of Sex with Grade of Glioma

Sex		Grade				Total
		I	II	III	IV	
Male	Cases	25	62	21	60	168
	%	14.9%	36.9%	12.5%	35.7%	100.0%
Female	Cases	15	35	12	33	95
	%	15.8%	36.8%	12.6%	34.7%	100.0%
Total	Cases	40	97	33	93	263
	%	15.2%	36.9%	12.5%	35.4%	100.0%

P=0.997

In this study, out of 263 cases, a total of 222 cases (84.4%) showed concordance with radiological and final histopathological diagnosis. Squash smear findings showed high diagnostic accuracy on comparison with the final histopathology diagnosis. Diagnostic accuracy of squash findings in the present studywas90.4%.Complete concordance was observed in most of the high-grade tumors.

Figure 2:MRI picture - Ependymoma Contrast Enhancing Lesion in Floor of Fourth Ventricle

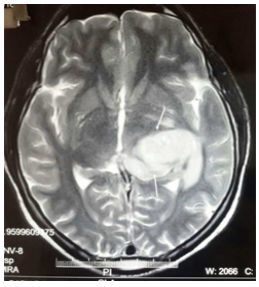

Figure 3: MRI Picture - GlioblastomaMultiforme

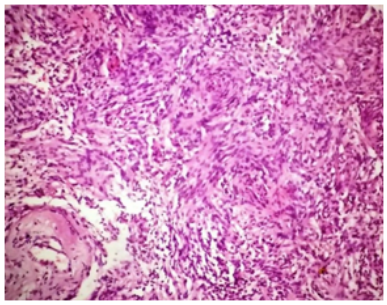

Figure 4: H&E 100X Pilocytic Astrocytoma

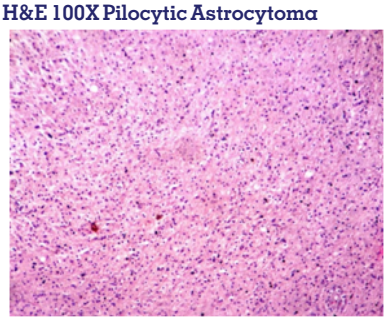

Figure 5: H&E 100X Oligodendroglioma

DISCUSSION

Annual incidence of CNS neoplasms ranges from 10-17/100,000 people for intracranial tumors and 1- 2 /100000 people for intraspinal tumors. In children 70% of tumors occurs in posterior fossa and in adults most common is the cerebral hemisphere above the tentorium. Brain cancer accounts for1.4% of all cancer deaths and 2.3% of all cancer related deaths. Surawicz et al showed that whites are affected more than blacks [4]. WHO 2007 classifies gliomas according to cellularity, mitoses, pleomorphism, necrosis and endothelial proliferation [5].Pilocyticastrocytoma, Desmoplastic astrocytoma, Myxopapillaryependymoma are grouped as Grade 1. Diffuse infiltrating astrocytomaa) fibrillaryastrocytoma, b)Gemistocyticastrocytoma c) protoplasmic, Mixedgliomas, Pleomorphic xanthoastrocytoma, Oligodendroglioma, Ependymoma are graded as grade II gliomas. Anaplasticastrocytoma, Anaplastic ependymoma, Anaplasticoligodendroglioma, Anaplasticoligoastrocytoma are grade III gliomas. Glioblastomamultiforme, Giant cell glioblastoma, Gliosarcoma are grouped as grade IV gliomas. Gliomas are most common malignancies in CNS tumors and they account for 40% of all primary brain neoplasms. In the present study, histomorphological analysis was done for 263 cases of glioma. Madras Medical College being a tertiary referral center, the relative frequency of gliomas among the neuro surgical caseswas31.4% among the entire neuro specimens.

Comparison of age incidence of gliomas.

In our study the peak incidence of gliomas was 41 -60 years. The maximum age observed was 85 years and the minimum age in which glioma was observed was 6 months. It showed a mean age of 38 years with a standard deviation of 19.6 (Table 1). The median age at diagnosis in males was 40 years, and 37 years in females. This is similar to study of Gurney et al[6], and Vovoras et al[7].

Comparison of sex incidence of gliomas

At all age groups, males are most commonly affected than females (Table2). This correlates with study of vovorosa et al [7] but does not correlate with ICMR studies. In our study most of the tumors have male predilection except oligoastrocytoma and ependymoma (Figure 2) which show female predominance. These findings did not correlate with the study of vovorosa et al[7].

Comparison of distribution of histopathological subtypes of gliomas

From the data in our institute it is clear that out of the 263 gliomas studied in a two-year period Glioblastomamultiforme (Figure 3) was the most common one accounting for 94 cases (35.7%). Pilocyticastrocytoma (Figure 4) was the second most common glioma accounting for 38 cases (14.4%). Least common were pleomorphicx anthoastrocytoma(1.1%), oliogoastrocytoma (1.9%), anaplastic oliogoa strocytoma, (0.8%), Anaplastic oligodendroglioma (0.8)%. (Table 3). These findings are in correlation with study of Larjavaara et al[8]. In an analysis made in nationwide registry 2005 in Korea studied 5,692 patients who were diagnosed as primary brain neoplasms, it was seen that CNS tumors occurred in a F:M ratio of 1.43:1. It was found that meningiomas were the most common tumors (31.2%).Of all the gliomas, 30.7% was glioblastomas, and among the malignant tumors of CNS19.3%wereglioblastomas.The medulloblastoma and germ cell tumors were the most common tumors below 19 years of age. This study showed the epidemiology in Korea.[9]

Comparison of side of brain involved in glioma

In our study, Right hemisphere of brain was most commonly involved(44.8%) than the left (33.07%), and other midline deep structures (22.05%). This correlates with study of larjavara et al[8].

Comparison of site incidence of gliomas

In our study the cerebral lobes are most commonly involved by the glioma that is 79% of which frontal lobe has the highest incidence of cases accounting to 19.8 % (52 cases). The second most common is the temporoparietal region accounting to 12.9 % (34 cases). The occipital lobe showed the least common involvement accounting to (4.6%) 12 cases(Table 4).The findings in our study is more or less similar to the study of Larjavaara et al, except for parietal lobe involvement which is only 6.5% in our study when compared to Larjavaara et al in which the parietal lobe involvement was 14%.In our study ,in the spinal cord out of the 14 cases, intradural intramedullary lesions were most common accounting to 10 cases(3.8%),intradural extra medullary lesions was second most common accounting to 3 cases (1.1%) and one case was extradural lesion accounting to 0.4% of total cases. There are no studies in literature to correlate these lesions.

Comparison of tumor types with age groups

Pilocytic astrocytoma was found to most commonly affect the age group of 0 to 20 years in this study. Myxopapillary ependymoma was found commonly affect the age group of 20-40 years. Diffuse fibrillary astrocytoma was most commonly affecting the age group of 21-40 years. Diffuse astrocytoma showed maximum incidence in 20-60 years.

Pleomorphic xanthoastrocytoma- three cases were studied, two cases occurred in 41-60 years. (66.7 %). Anaplastic astrocytoma, occurred in 21-40 years age group following a relative percent of 57.1%. Glioblastomamultiforme maximum cases occurred in an age group of 41-60 years with 60.6%. (Figure 1). Above study correlates with the study of Dr.D.vovorasa etal.(Table 7).

TABLE - 7

Comparison of sub types of gliomas with age groups

D. Vovorasa*et al*			Our Study		
Age			Age		
0-19	20-64	>65	0-19	20-64	>65
Specified low grade astrocytictumor					
1820 (32%)	1743 (6%)	347 (2%)	33 (55%)	8 (5%)	0 (0%)

Glioblastoma and anaplasticastrocytoma					
605 (11%)	14858 (52%)	12496 (72%)	2 (3%)	93 (53%)	20 (77%)
AstrocytomaNOS					
1315 (23%)	5165 (18%)	2385 (14%)	4 (7%)	41 (23%)	4 (15%)
Other Glioma					
1399 (24%)	5544 (19%)	1971 (11%)	3 (5%)	23 (13%)	2 (8%)
Ependymoma					
588 (10%)	1204 (4%)	184 (1%)	18 (30%)	12 (7%)	0 (0%)
5727	28514	17383	60	177	26

Comparison of WHO grade of tumors

In our study, it was found that the WHO grade II tumors were of maximum incidence (36.9 %),the second most common was WHO grade IV tumors(35.4%) ,the third common was WHO grade I tumors(15.2%),and fourth place was taken by WHO grade III tumors(12.5 %.) These observations correlated with studies of Larjavara etal.[8] .WHO grade 1 tumor was most common in age group of less than 20 years (53.3%.). WHO grade II was most commonly seen in age group of 21-40 years (50.6 %.). WHO grade III and IV tumors are commonly seen in the age group above 80 years (75%). There are no studies to correlate the age and grade of the tumors.(Table 5).

Comparison of WHO grade with sex

It has been inferred from the table 6 that WHO grade IV tumors(the most malignant form of glioma) was common among male as compared to other grades of tumor. WHO grade I and II tumors showed slight increase incidence in females. This shows concordance with the popular hypothesis that benign and low-grade tumors are common in women while the more malignant forms are common in men. There are no studies found in literature. The sex distribution of gliomas in our study did not correlate with study of vovorosa et al.

Correlation between radiological and squash diagnosis with final histopathological diagnosis

In this study radiological diagnosis was 84.4% concordant with histopathologicaldiagnosis. This finding was well correlated with the study of Pant et al.[10] Total of 238 cases (90.4%) showed complete concordance with squash diagnosis and final histopathology diagnosis. This finding was correlated well with reports of Bhardwaj et al.[11]

CONCLUSION

In the present study, histomorphological analysis was done for 263 cases of glioma. The peak incidence of glioma was seen in 41-60 years, while least incidence of glioma was seen in age group of more than 80years. Gliomas showed a male preponderance. Total number of gliomas in males was 168 cases (63.9%) and in females was 95cases (36.1%). Glioblastomamultiforme was the most common glioma in our institute and Pilocytic astrocytoma was the second most common glioma. Right hemisphere of brain was most commonly involved than left side. The cerebrum is most commonly involved by the glioma, of which frontal lobe is the most common site. Most of the Gliomas are WHO grade II followed by WHO grade IV tumors, grade 1 tumors were more common in age group of less than 20 years. WHO grade II was most common in age group of 21-40 years. WHO grade III and IV tumors were common in the age group above 60years.

Gliomas include wide range of subtypes and grades. Accurate diagnosis is mandatory for the management of these tumors and also to predict the prognosis. So multidisciplinary team approach is required for the accurate diagnosis of these brain tumors. Our study draw attention to various clinicopathological aspects of 263 cases of different types of gliomas. Addition of molecular biomarkers and longer follow up periods are required for better understanding of the biological behavior of gliomas

REFERENCES:

[1] Shankarkumar, U., &Sridharan, B. (2011). Glioma Indian scenario: Is there a human leucocyte antigen association?. Journal of natural science, biology, and medicine, 2(2), 205–208. https://doi.org/10.4103/0976-9668.92323

[2] Balkrishna B Yeole: (2008). Trends in the Brain Cancer Incidence in India. Asian Pacific Journal of Cancer Prevention, 9(2), 267-270.

[3] Kurland, L.T., Schoenberg, B.S., Annegers, J.F., Molgaad, C.A and Okazaki, H.(1982) The incidence of primary intracranialneoplasms in Rochester,Minnesota 1935–1977. 1982 ,Ann. N. Y. Acad.Sci. 381, 6–16.https://doi.org/10.1111/j.1749-6632.1982.tb50361.x

[4] Surawicz, T. S., McCarthy, B. J., Kupelian, V., Jukich, P. J., Bruner, J. M., & Davis, F. G. (1999). Descriptive epidemiology of primary brain and CNS tumors: results from the Central Brain Tumor Registry of the United States, 1990-1994. Neuro-oncology, 1(1), 14–25. https://doi.org/10.1093/neuonc/1.1.14

[5] Louis, D. N., Ohgaki, H., Wiestler, O. D., Cavenee, W. K., Burger, P. C., Jouvet, A., Scheithauer, B. W., &Kleihues, P. (2007). The 2007 WHO classification of tumours of the central nervous system. Actaneuropathologica, 114(2), 97–109. https://doi.org/10.1007/s00401-007-0243-4

[6] Gurney J G. Severson R K, Davis S, Robison LL: (1995). Incidence of cancer in children in the United States. Cancer 75(8):2186-2195.

[7] Vovoras, D, Pokhrel, K, and Tsokos, C.P. (2014) Epidemiology of Tumors of the Brain and Central Nervous System: Review of Incidence and Patterns among Histological Subtypes , Open Journal of Epidemiology, 4,224-223.

[8] Larjavaara, S., Mäntylä, R., Salminen, T., Haapasalo, H., Raitanen, J., Jääskeläinen, J., &Auvinen, A. (2007). Incidence of gliomas by anatomic location. Neuro-oncology, 9(3),319–325.https://doi.org/10.1215/15228517-2007-016

[9] Lee, C. H., Jung, K. W., Yoo, H., Park, S., & Lee, S. H. (2010). Epidemiology of primary brain and central nervous system tumors in Korea. Journal of Korean Neurosurgical Society, 48(2),145–152. https://doi.org/10.3340/ jkns. 2010.48.2.145

[10] Pant I, Chaturvedi S, Jha DK, Kumari R, Parteki S. (2015) Central nervous system tumors: Radiologic pathologic correlation and diagnostic approach. Journal of Neurosciences in Rural Practice. Apr-Jun;6(2):191-197. DOI: 10.4103/0976-3147.153226.

[11] Bhardwaj, K., Kriplani, D., Bhake, A., & Bhardwaj, K. (2017). Study of intraoperative squash cytology of intracranial and spinal cord tumors. International Journal of Research in Medical Sciences, 3(11), 3101-3108.doi:http://dx.doi.org/10.18203/2320-6012. ijrms20151144