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Frequency and Topography of AstrocyticTumor: Experience of 567 Cases at Referral Neuroscience Hospital in Bangladesh

Md. Nowfel Islam[1], Naila Haq[2], Md. Badius Salam[3], Monsur Ahmed[4], Sk. Muhammad Ekramullah[5], Md. Zahed Hossain[6], Sk. Sader Hossain[7], Sadia Shirin[8]

[1]Professor and Head, Department of Neuropathology, National Institute of Neurosciences & Hospital, Dhaka, Bangladesh; [2]Associate Professor, Department of Neuropathology, National Institute of Neurosciences & Hospital, Dhaka, Bangladesh; [3]Assistant. Professor and Head, Department of Radiation Oncology, Sir Salimullah Medical College, Dhaka, Bangladesh; [4]Assistant Professor. Department of Neurosurgery, National Institute of Neurosciences &Hospital, Dhaka, Bangladesh; [5]Professor and head, Department of Pediatric Neurosurgery, National Institute of Neurosciences & Hospital, Dhaka, Bangladesh; [6]Professor of Neurosurgery, National Institute of Neurosciences& Hospital, Dhaka, Bangladesh; [7]Professor and Head, Department of Neurosurgery, National Institute of Neurosciences & Hospital, Dhaka, Bangladesh; [8]Medical Officer, Department of Neuropathology, National Institute of Neurosciences & Hospital, Dhaka, Bangladesh

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Abstract

Background: Glioma is the most commonly occurring malignant brain tumor that varies by age, sex, race or ethnicity. A very few number of records on CNS tumors are available in Bangladesh. National Institute of Neurosciences and Hospital (NINS), Dhaka has a good number of CNS surgeries. Regularly both tumorous and non-tumorous ICSOL samples are examined here. **Objective:** The aim of the study was to see the subtypes, frequency and topography of Astrocytic tumors at NINS setting. **Methodology:** Data from the department of Neuropathology department of NINS since January 2013 to June 2019 were evaluated. Tissue were fixed in formalin, paraffin embedded, stained with H&E. Histomorphology and WHO 2007 CNS tumor classification were used. **Result:** From 3945 routine sample 567 cases were sorted out as Astrocytic tumor. Total male were 61% (346) and female 39% (221), male to female ratio was 1.6:1. The mean age was 32.64 and ranged from 1 to 80 years. Sixty six percent (66%) tumors were in supratentorial compartment, 15% infratentorial, 6.3% spinal and 9.7% in midline areas like thalamus, hypothalamus and seller region. In this study 34.6% (196) cases were Glioblastoma, followed by Anaplastic Astrocytoma 8.3%(47), Diffuse Astrocytoma 29% (165), Pilocytic Astrocytoma 26.6% (151), Pilomyxoid Astrocytoma 0.4% (2), Subependymal giant cell Astrocytoma 0.9% (5) and Pleomorphic Xanthoastrocytoma 0.1 (0.1). Topographically 66% glial tumors are supratentorial. Among the glial tumors 34.6% is Glioblastoma, 8.3% Anaplastic Astrocytoma, 29% Diffuse Astrocytoma and 26.6% Pilocytic astrocytoma. Common age group of Glioblastoma is 41-60 (52%) years, diffuse astrocytoma is 21-40 years 60.60 and Pilocytic Astrocytoma is 1-20 years (66.88). Glioblastoma, Anaplastic Astrocytoma and Diffuse astrocytoma are more common in male than female. **Conclusion:** There is no gender difference in case of Pilocytic Astrocytoma. *[Journal of National Institute of Neurosciences Bangladesh, July2020;6(2): 91-95]*

Keywords: Topography;glial tumors; subtypes; gender

Correspondence: Prof. Md. Nowfel Islam, Professor and Head, Department of Neuropathology,National Institute of Neurosciences & Hospital, Sher-E-Nagar, Agargaon, Dhaka, Bangladesh; Email: nowfel2008@gmail.com; Cell no.: +8801552365185

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Introduction

Since 1970, CT and MRI technique have dramatically increased the number of ICSOL cases everywhere[1]. Imaging techniques provided a scope for better recording of non-tumorous and tumorous lesion and improved clinical practice[1]. In this advanced era a number of

craniotomy is done in neurology hospitals and also in tertiary level hospitals. The prevalence of CNS neoplasm is highly variable[2]. It appears to be higher in developed countries and lesser in less developed countries[2]. It accounts for about 2% of all cancer death[3]. The age standardized incidence of overall CNS tumor found as 17/100000 (Europe), 17/100000 (US) and 13/100000 (World)[3]. Primary CNS tumors are complex heterogeneous group of lesion based mostly on histology, gender, age, geographic distribution and biology. Also there are topographic heterogeneity[1]. In the year 2016 'WHO has restructured the 2007 classification of Primary CNS tumor incorporating histogenesis, immunohistochemical expression and molecular study. Histologic grading of CNS tumors are determined by the cellularity, malignant mitotic activity, vascular proliferation and necrosis. Including tumor grading, age, location, radiologic features, performance status, extent of surgical resection, proliferation indices and genetic alteration are well established prognostic factors. Histogenesis, molecular subtypes on immunostain and genetic alteration are main focus in this molecular era. Glioma is the most commonly occurring malignant brain tumor in the USA and its incidence varies by age, sex, race or ethnicity[5]. Survival after brain tumor diagnosis has been shown to vary by these factors including topography and subtypes. A very few number of records on CNS tumors are available in Bangladesh. National Institute of Neurosciences and Hospital (NINS), Dhaka is working since 2012. It has a good number of CNS surgeries. Regularly both tumorous and non-tumorous ICSOL samples are examined here. The aim of the study was to see the subtype, frequency and topography of astrocytic tumors at NINS setting.

Methodology

This was a retrospective study which was conducted in the Department of Neuropathology at National Institute of Neurosciences and Hospital, Dhaka, Bangladesh. Data recorded in the department from January 2013 to June 2019 were analyzed for this study. The samples were formalin fixed, paraffin embedded, stained with H&E and were examined jointly by departmental pathologists. Histomophology along with WHO 2007 CNS tumor classification were followed. SPSS version 16 was used for data processing. The Chi-square test and Kruskal Wallis non-parametric test were done when required.

Results

A total of 567 cases were sorted out as Astrocytic tumor from 3945 CNS samples. Out of 567cases, 61% (346) were male and 39% (221) were female, male to female ratio was 1.6:1 (Figure I).

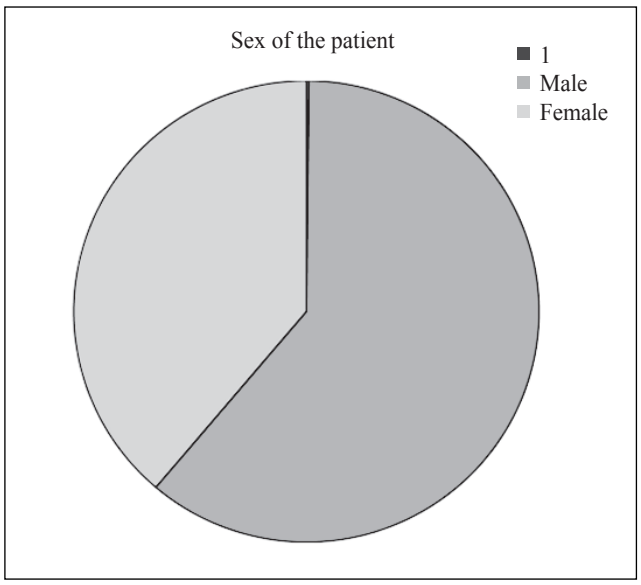

Figure I: Histogram showing Age Distribution of the Patients

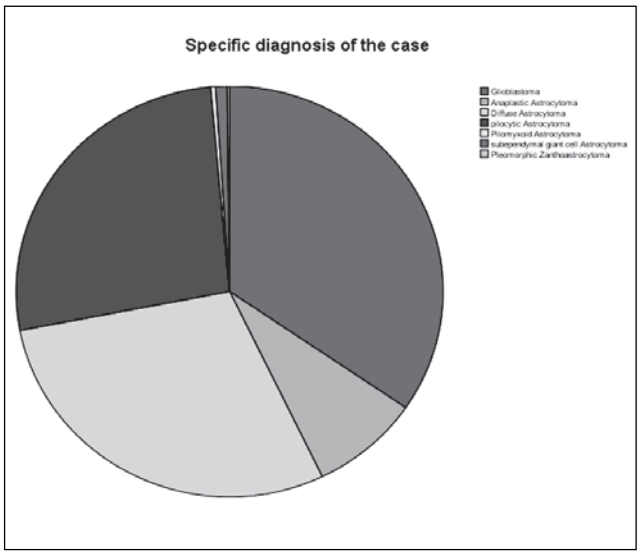

Figure II: Showing the distribution of specific diagnosis of study population

The mean was 32.64 and it ranged from 1 to 80 years (Table 1).

Anatomically 66% the tumors were located in the cerebral cortex (Supratentorial), 15% in cerebellum (Infratentorial), 6.3% in spinal and 9.7% midline areas like thalamus, hypothalamus and seller region (Table 2).

Table 1: Distribution of Subtypes of Astrocytic tumors according to age

Diagnosis	Total	Mean age (Year)	SD
Glioblastoma	**196**	45.60	16.096
Anaplastic Astrocytoma	**47**	34.83	16.15
Diffuse Astrocytoma	**165**	30.87	12.90
Pilocytic Astrocytoma	**151**	18.03	13.10
PMA	**2**	14.00	14.14
SEGA	**5**	13.60	5.128
PXA	**1**	18	

p=.000;Kruskal Wallis non-parametric test

The mean number of fragments per sample was 7 and the highest number was 20 fragments in a sample. The mean size of the fragments submitted was 0.2 cm. The largest fragment of sample was 0.5 cm and lowest was 0.1 cm in diameter (Table 3).

Table 2: Distribution of Subtypes of Astrocytic tumors According to location

Subtypes of Astrocytic tumors	Frequency	percent
Supratentorial	367	65
Infratentorial	85	15
Spinal	36	6.3
Seller region	22	3.9
Mid-line	55	9.7
Miscellaneous	2	4

Within the sorted glial tumors this study detected 34.6 (196) glioblastoma, followed by anaplastic astrocytoma 8.3% (47), diffuse astrocytoma 29% (165), pilocytic astrocytoma 26.6% (151), pilomyxoid astrocytoma 0.4% (2), subependymal giant cell

Table 3: Removal of arsenic by different extracts of spirulina from isolated liver tissues of rat

	Size of the sample in mm						
Diagnosis	**1**	**2**	**3**	**4**	**5**	**>6**	**Total**
Glioblastoma	0(0%)	1(9.1%)	0(0)	3(33.3%)	6(23.1%)	186(36.5)	196(34.6)
Anaplastic Astrocytoma	0(0)	1(9.1%)	1(14.33)	0(0)	4(15.4%)	41(8.1%)	47(8.3%)
Diffuse Astrocytoma	0(0)	2(18.2%)	2(28.6)	2(22.2%)	4(15.4%)	155(30.5%)	165(29.1%)
Pilocytic Astrocytoma	5(100)	7(63.6%)	4(57.1)	4(44.4%)	11(42.3%)	150(23.6%)	151(26.6%)
PMA	0(0)	0(0)	0(0)	00(0)	0(0)	2(4%)	2(4%)
SEGA	0(0)	0(0)	0(0)	0(0)	1(3.8%)	4(8%)	5(9%)
PXA						1(2%)	1(2%)

PA= Pilomyxoid Astrocytoma, SEGA= Subependymal giant cell astrocytoma, PXA=Pleomorphic xanthoastrocytoma

Table 5: Removal of arsenic by different extracts of spirulina from isolated liver tissues of rat

Diagnosis sex	**Age (<20 yrs)**	**21-40 yrs**	**41-60 yrs**	**>60 yrs**	**Total**	**Grand Total**
Glioblastoma						
Male	9(7.2%)	27(21.6%)	71(56.8%)	18(14.4%)	125(36.1%)	196(34.6%)
Female	11(15.5%)	17(23.9%)	31(43.7%)	12(16.9%)	71(32.3%)	
Anaplastic astrocytoma						
Male	7(25.9%)	12(44.4%)	8(29.6%)	0	27(7.8%)	47(8.3%)
Female	4(20.0%)	8(40.0%)	7(35.0%)	1(5.0%)	20(9.1%)	
Diffuse astrocytoma						
Male	23(20.7%)	66(59.5%)	21(18.9%)	1(0.9%)	111(32.1%)	165(11.5%)
Female	12(22.2%)	34(63.0%)	6(11.1%)	2(3.7%)	54(24.5%)	
Pilocytic astrocytoma						
Male	54(68.9%)	20(25.6%)	4(5.1%)	1(0.9%)	79(23.4%)	151(26.6%)
Female	47(65.3%)	20(27.8%)	5(6.9%)	0	72(32.7%)	
Pilomyxoid astrocytoma						
Male	1(100%)	0	0	0	1(0.3%)	2(.35%)
Female	0	1(100%)	0	0	1(0.5%)	
SGCA						
Male	2(66.7%)	1(33.3%)	0	0	3(0.9%)	5(.88%)
Female	2(100%)	0	0	0	2(0.9%)	
Pleomorphic XA						
Male	1(100%)	0	0	0	1(0.3%)	1(.18%)
Female	0	0	0	0	0	

p=.000 (Kruskal Wallis non-parametric test)

Table 4: Distribution of Astrocytic tumors according to Number of tissue fragments in the sample received

Diagnosis	Total	Mean	S.D
Glioblastoma	**196**	7.27	6.720
Anaplastic Astrocytoma	**47**	8.17	7.130
Diffuse Astrocytoma	**165**	6.93	6.541
Pilocytic Astrocytoma	**151**	6.68	6.48
PXA			
Pleomorphic xanthoastrocytoma	**1**	1	100

astrocytoma 0.9% (5) and pleomorphic xanthoastrocytoma 0.1 (0.1) (Table 4).

Discussion

The prevalence of CNS neoplasm is highly variable in respect to age, sex and ethnicity[5]. The age range of this study found was 1 to 80 years and the mean age was 32.64 years. This wide spectrum of occurrence of Astrocytic tumor is consistent with the report of Quinn T Ostrom[5] and other world report. Out of 567 cases glial tumors 346(56. 61%) male and 220 (39%) were female; male to female ratio was 1.6:1. David N. and his colleagues[4] reported male prevalence and showed a great difference in Glioblastoma where the incidence was 60% higher in males[4]. Tai□Tong Wong M.D reported on 986 cases of primary pediatric brain tumors with M: F 1.4:1 and mean age was 7.8 years[10]. Kyu-Won Jung et al. reported Astrocytic tumor in male 38.6% and in female 61.4%[6]. The current study observed similar frequency of Glioma in respect to gender i.e. male 61% (346) and female 39% (221). The higher number of male cases is consistent with other studies as above. The extent of surgical removal of an ICSOL is an individual prognostic factor[5]. The anatomic location of a tumor provide the scope of sampling, partial removal, near total or total removal of the tumor. In this study we found 66% cases in the cerebral cortex, 15% in cerebellum, 6.3% in spinal and 9.7% in midline areas. The highest number of fragments per sample was 20, lowest number was 1 (one) and the mean number of fragments was 7 in a sample. The number of tissue fragments and size of the fragments did not have any role in the diagnosis. In this study no significant role of tissue fragments number was observed so also the size of the fragments.

David N. Louis and colleague reported 5.4% Glioma in adults[4] and the Glioblastoma was higher in male (60%) in their study. Kyu-Won Jung and coworkers reported 18.7% Glioma cases out of 1873 CNS samples in their study[6]. Glioblastoma accounted for 5.2% of all tumors in their study. They reported Glioblastoma 40.6%, Diffuse Astrocytoma-NOS 7.1%, Anaplastic Astrocytoma 10.1%, and Pilocytic Astrocytoma 5.7%. David N. Louis and colleagues[4] reported the sex prevalence on Astrocytic tumors. They reported the Male female occurrence as 56.3% and 43.7% respectively. The Glioblastoma was higher in male (60%) in their study. Quinn T Ostrom[5] reported that Glioblastoma is 60% more in male than in female. The current study we observed similar occurrence of Glioma in respect to sex of the individual i.e. reveals 61% (346) male and 39% (221) female with Astrocytic tumors. The higher number of male cases is consistent with other study in world population as described above.

Emanuele Crocetti and colleagues found 86.0% Astrocytic tumor out of 44, 947 cases CNS lesions. In Astrocytic group 24% low grade, 63% high grade and 13% Glioma were diagnosed as NOS[7]. Brian P. McKinley M.D and coworkers noticed dominance of three Glial tumors like Glioblastoma (GBM), Astrocytoma (NOS), and Anaplastic Astrocytoma[8]. They stated that increases in age-specific incidence of GBM were primarily limited to patients 60 years of age or older. They stated that the female population had a lower risk of developing these tumors than male[8]. Also Brian P. McKinley M.D et al. suggested that sex hormones and/ or genetic differences may play a role in the pathogenesis of this tumor. The overall protective effect of female sex for GBM described in their study was also similarly suggested by van der Sanden and co-workers[9]. In that study the High-grade Astrocytic tumors was (70–75%) and low-grade was (20–25%). The incidence of high-grade Astrocytoma increased sharply with age and declined after the age of 70. Male to females-ratio were relatively high for these tumor types[9]. In the current study the Glioblastoma was 10% (20) in 1-20 yrs, 22.5% (44) in 21-40 yrs, 52% (102) cases in 41-60 years and 15% (30) cases above 60 years. From this observation it can be stated that the prevalence of GBM is more in 4th and 5th decade and it tends to decline after 60 in our setting. This observation is consistent with other previous the study.

Diffuse Astrocytoma occurs most often in adults between the ages of 20 and 40 years of age[14]. Birthe Krogh Rasmussen et al. observed 57% of glial tumor as diffuse Astrocytoma[15]. The current study recorded 29% glial tumor as diffuse Astrocytoma. It is more prevalent in 20-40 age group where the occurrence found 55%. This findings are similar findings of Birthe Krogh Rasmussen et al[15].

Pilocytic Astrocytoma may occur at any age, makes up

approximately 5.1 % of all Glioma and is most common inchildren[11]. According to Strom QT Male are slightly more frequently affected than female[12]. According to this study, it is the most frequently primary brain tumor in 0-19 years old. It declines from 10-14 age group to the 15-19 years. PA can arise anywhere in the CNS but most frequently occurs in the cerebellum (42 %), followed by supratentorial compartment (36 %)[12]. Mirim Bornst and coworkers reported that Pilocytic Astrocytoma typically affect patients under the age of 20, and accounting for about 15.6% of primary brain tumors in children and adolescents. They also reported that 75% of Pilocytic Astrocytoma occurring in the first two decades of life, typically late in the first decade (9-10 years)[13]. Mirim Bornst and coworkers found no recognized gender predisposition[14]. In the current study it is found that 26.6%(151) with male predominance and highest occurrence in 1st and 2nd decade. Also we found no sex difference in gender and age groups (Table. %). According to site 78% of PA was present in the cerebellum. This is in consistent with the findings of Mirim Bornst[13].

Conclusion

In conclusion glial tumors are sorted out. Topographically most of the glial tumors are supratentorial. The glial tumors show wide range of variability in respect to location, age, sex and subtypes. The 'location', 'gender' and 'subtypes' of an intracranial tumor each are considered as individual prognostic factor. A wide range of follow up study may be carried out to establish such individual prognostic factors in our setting.

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