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Pattern of Histopathological Grades of Astrocytoma Patients attended at a Tertiary Care Hospital in Dhaka City

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Abstract

Background: Different grades of astrocytomas are presented as the variant of brain tumour. **Objective:** The purpose of the present study was to evaluate the frequency and distribution of different grades of astrocytoma patients. **Methodology:** This cross sectional study was carried out in the Department of Radiology and Imaging with the collaboration of Department of Neurosurgery and Department of Pathology at Sir Salimullah Medical College (SSMC & MH), Dhaka from January 2013 to December 2013 for a period of one (1) year. Patients presented with clinically diagnosed cases of intracranial astrocytoma who were attended in the OPD and IPD were selected as study population. The postoperative resected tissues were histopathological examined in the respective department. **Result:** The sample size of the present study was 48 astrocytoma patients. The mean age (±SD) was 39.96 years (±12.440). During MRI pilocytic astrocytoma, low grade astrocytoma, anaplastic astrocytoma and glioblastoma multiformis are found in 8.3% cases, 31.2% cases, 52.1% cases and 52.1% cases respectively. **Conclusion:** MRI is an effective tool for the diagnosis of astrocytoma. *[Journal of National Institute of Neurosciences Bangladesh, July 2023;9(2):147-150]*

Keywords: Magnetic Resonance Imaging; astrocytoma; validity test

Introduction

Astrocytomas are central nervous system (CNS) neoplasm in which the predominant cell type is derived from an immortalized astrocyte[1]. Two classes of astrocytic tumours are recognized; those with narrow zones of infiltration like pilocytic astrocytoma, sub-ependymal giant cell astrocytoma, pleomorphic xanthoastrocytoma and those with diffuse zones of infiltration like low-grade astrocytoma, anaplastic astrocytoma, glioblastoma[2]. Members of the latter group share various features including the ability to arise at any site in the CNS, with a preference for the cerebral hemispheres, clinical presentation usually in adults, heterogeneous histopathological properties and biological behaviour, diffuse infiltration of contiguous and distant CNS structures, regardless of histological stage and an intrinsic tendency to progress to more advanced grades[3].

Numerous grading schemes based on histopathologic characteristics have been devised, including the Bailey and Cushing grading system[4], Kernohan grades I-IV[5], World Health Organization (WHO) grades I-IV[6] and St. Anne/Mayo grades 1-4[7]. The widely accepted WHO grading scheme relies on assessments of nuclear atypia, mitotic activity, cellularity, vascular proliferation, and necrosis[8]. WHO grade I corresponds to pilocytic astrocytoma, WHO grade II corresponds to low-grade (diffuse) astrocytoma, grade III corresponds to anaplastic astrocytoma, and grade IV corresponds to glioblastoma multiforme (GBM)[9]. The purpose of the present study was to evaluate the frequency and distribution of different grades of astrocytoma patients.

Methodology

Study Settings and Population: This was an observational type of cross sectional study and was carried out in the Department of Radiology and Imaging with the collaboration of Department of Neurosurgery and Department of Pathology at Sir Salimullah Medical College (SSMC & MH), Dhaka from January 2013 to

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December 2013 for a period of one (1) year. Patients who were clinically suspected and CT-scan diagnosed cases of intracranial astrocytomas referred to Radiology and Imaging department of DMCH either from OPD or from indoor of DMCH for MRI of brain were included in this study.

Study Procedure: The sampling technique was purposive, non-random sampling method. All cases having no contraindication for MRI underwent MR examination. Patients were asked for or checked for any metallic or harmful materials. MR imaging was obtained with 0.3 Tesla machine (HITACHI). T1W image in axial, sagittal and coronal plane were obtained using short TR (500-800ms) and short TE (14-20ms). T2W image in axial and coronal plane were obtained using long TR (3500-4500ms) and long TE (80ms). FLAIR images were also taken. Contrast MRI studies using intravenous Gd-DTPA (Magnevist, 0.1 mmol/Kg) with axial, coronal and sagittal T1W scan were performed in all cases. The average time of examination was 45 minutes which ranged from 30 to 90 minutes. Slice thickness was 5 to 6 mm with a field view 230x230 mm and pictures matrix was 256x256 or 192x256. The postoperative resected tissues were examined histopathologically in the respective department. MRI findings were compared with histopathological reports. Then the collected reports were compared with findings of MRI. Data were collected using a preformed data collection sheet. Base line information was collected from the patient after exploration of different complaints and sign and symptoms. All information regarding clinical features and histopathological results were recorded in a data collection sheet.

Statistical analysis: Statistical analysis was performed by using window based computer software devised with Statistical Packages for Social Sciences (SPSS-17) (SPSS Inc, Chicago, IL, USA). 95% confidence limit was taken.

Ethical Consideration: Submitted the research protocol to the Institutional Review Board (IRB) of local institute to review the scientific and ethical issues related to the research to obtain the required approval. The study objectives were explained to each participant and written informed consent was taken from the patient who willingly participated in the study. Strictly maintained treatment and investigation papers confidentiality. The information of the treatment and investigation papers were only used for this research purpose. Thus, the researcher maintained the anonymity of the individual patients.

Results

A total number of 69 patients were recruited in this study of which 1 patient refused to undergo surgery, 2 patients were unfit for the same and in 4 cases, histopathological reports were not available. Ultimately 62 patients were evaluated finally. Among 48 astrocytoma patients majority are from the age group of 30 to 40 years which is 17(35.4%) cases followed by 40 to 50 years, more than 50 years and 20 to 30 years which are 13(27.1%) cases, 10(20.8%) cases and 5(10.4%) cases respectively. Only 3(6.2%) cases are from the age group of less than 20 years. The mean age (±SD) is 39.96 years (±12.440) with a range of 13 to 69 years (Table 1).

Table 1: Distribution of Study Population according to Age (n=48)

Age Group	Frequency	Percentage
Less Than 20 Years	3	6.2
20 To 30 Years	5	10.4
30 to 40 Years	17	35.4
40 to 50 Years	13	27.1
More Than 50 Years	10	20.8
Total	**48**	**100.0**

* Mean ±SD = 39.96±12.440 (13-69)

In this study male is predominant than female which is 30(62.5%) cases and 18(37.5%) cases respectively. The male and female ratio is 1.67 and 1 (Table 2).

Table 2: Distribution of Study Population according to Sex (n=48)

Gender	Frequency	Percentage
Male	30	62.5
Female	18	37.5
Total	**48**	**100.0**

*Male : Female= 1.67:1

Pilocytic astrocytoma (Grade-1) is found in 4(8.3%) cases. Low grade astrocytoma (Grade-II) is found in 15(31.2%) cases. Anaplastic astrocytoma (Grade-III) is found in 20(52.1%) cases. Glioblastoma multiformis (Grade-1V) is found in 9(52.1%) cases (Table 3).

Table 3: Distribution of Study Population according to MRI Diagnosis (n=48)

MRI Findigns	Frequency	Percentage
Pilocytic astrocytoma (Grade-1)	4	8.3
Low grade astrocytoma (Grade-II)	15	31.2
Anaplastic astrocytoma (Grade-III)	20	52.1
Glioblastoma multiformis (Grade-1V)	9	16.7
Total	**48**	**100.0**

Pilocytic astrocytoma (Grade-1) is found in 5(10.4%) cases. Low grade astrocytoma (Grade-II) is found in 14(29.2%) cases. Anaplastic astrocytoma (Grade-III) is found in 21(43.8%) cases. Glioblastoma multiformis (Grade-1V) is found in 8(16.7%) cases (Table 4).

Table 4: Distribution of Study Population according to Histopathological Diagnosis (n=48)

Histopathological Diagnosis	Frequency	Percentage
Pilocytic astrocytoma (Grade-I)	5	10.4
Low grade astrocytoma (Grade-II)	14	29.2
Anaplastic astrocytoma (Grade-III)	21	43.8
Glioblastoma multiformis (Grade-IV)	8	16.7
Total	**48**	**100.0**

Discussion

Astrocytomas are histologically heterogeneous group[5]. It has varying degrees of cellular and nuclear pleomorphism, mitotic activity, vascular proliferation, and necrosis[8]. Astrocytomas are classified into three grades, lowgrade astrocytoma, anaplastic astrocytoma, and glioblastoma multiforme[4]. Accurate grading of astrocytoma is critical for planning therapeutic strategies, assessing prognosis, and monitoring response to therapy[10]. A difficulty in the management of astrocytomas is related to potential sampling errors and improper grading with needle biopsy.

The distribution of study population according to age is recorded. Among all the astrocytoma patients majority are from the age group of 30 to 40 years (35.4%) followed by 40 to 50 years (27.1%), more than 50 years (20.8%) and 20 to 30 years (10.4%). Only 6.2% cases are from the age group of less than 20 years. The mean age (±SD) is 39.96 years (±12.440) with a minimum age of 13 years and maximum is 69 years. Regarding intracranial astrocytomas, Chishty et al[11] has shown in their series that the mean age was 32.7 year with an age range from 1 year 10 months to 60 years. In Sanei et al[12] series, mean age of their patients was 41.8+19.3 age ranging from 7 to 78 years. In Ellika et al[13] series, mean age was 46.4 years. Similarly Osborn[14] has mentioned the peak occurrence of low grade astrocytomas between 20 to 40 years, high grade astrocytomas in 5th and 6th decades and higher age.

The distribution of study population according to sex is recorded. In this study male (62.5%) is predominant than female (37.5%). The male and female ratio is 1.67 and 1. Similar result was observed in Kane et al[15] and has reported that astrocytoma is more commonly occurred among the male. Sanei et al[12] also found incidence of astrocytomas higher in male with a ratio of approximately 1.6:1.

The distribution of study population according to MRI diagnosis is recorded. Pilocytic astrocytoma (Grade-1) is found in 8.3% cases. Low grade astrocytoma (Grade-II) is found in 31.2% cases. Anaplastic astrocytoma (Grade-III) is found in 52.1% cases. Glioblastoma multiformis (Grade-1V) is found in 16.7% cases. The distribution of study population according to histopathological diagnosis is recorded. Pilocytic astrocytoma (Grade-1) is found in 10.4% cases. Low grade astrocytoma (Grade-II) is found in 14(29.2%) cases. Anaplastic astrocytoma (Grade-III) is found in 43.8% cases. Glioblastoma multiformis (Grade-1V) is found in 16.7% cases. Similar to the present study Sanei et al[12] series has reported that glioblastoma multiforme (grade-IV) is the most common form of astrocytoma which is inconsistent with the present result; however, the findings of the other form of astrocytoma are similar to the study. Osborn[14] mentioned the frequency of glioma subtypes as 10.0% low grade astrocytoma which is similar to the present result. In another study Ellica et al[13] has reported that high grade gliomas are most common type of astrocytoma followed by low-grade gliomas which is consistent with the present result.

Conclusion

In conclusion, the findings of this study permit to conclude that MRI is an effective tool for the diagnosis of astrocytoma. Sensitivity, specificity and accuracy of MRI for the diagnosis of astrocytoma is high. MRI should be performed in suspected cases of astrocytoma patient.

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Contribution to authors: Khanam R, Khanam S conceived and designed the study, analyzed the data, interpreted the results, and wrote up the draft manuscript. Kabir T, Kabir E involved in the manuscript review and editing. All authors read and approved the final manuscript.

Data Availability
Any inquiries regarding supporting data availability of this study should be directed to the corresponding author and are available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate
Ethical approval for the study was obtained from the Institutional Review Board. As this was a prospective study the written informed consent was obtained from all study participants. All methods were performed in accordance with the relevant guidelines and regulations.

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